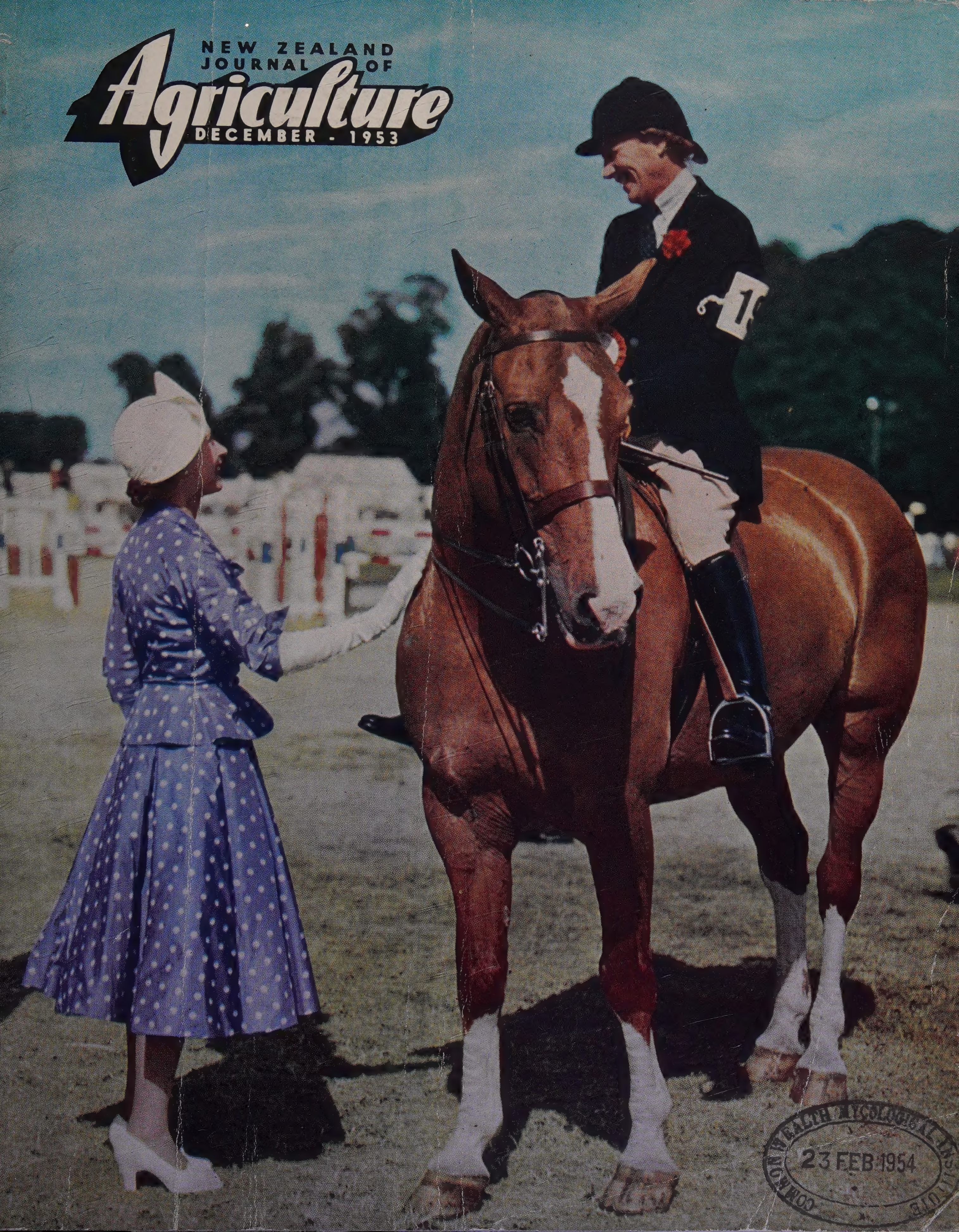
NEW ZEALAND JOURNAL OF

Agriculture

DECEMBER - 1953



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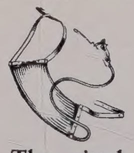

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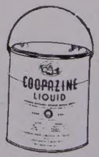

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NEW ZEALAND JOURNAL OF Agriculture

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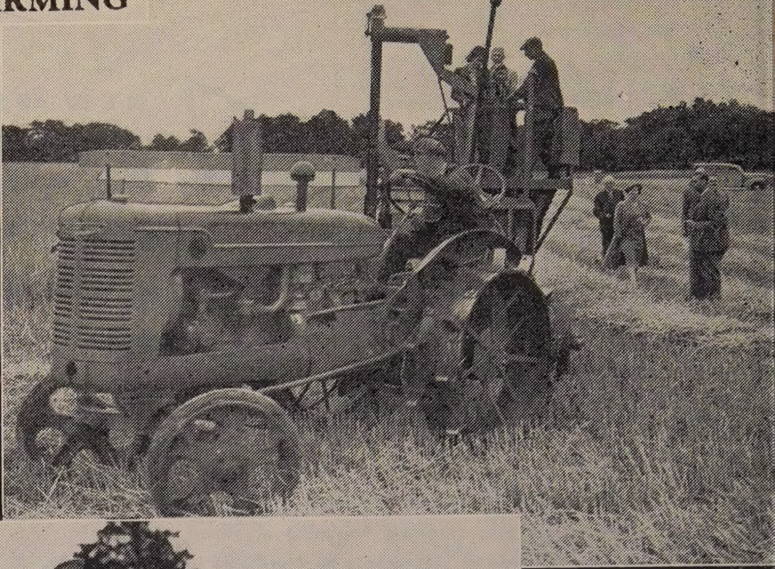
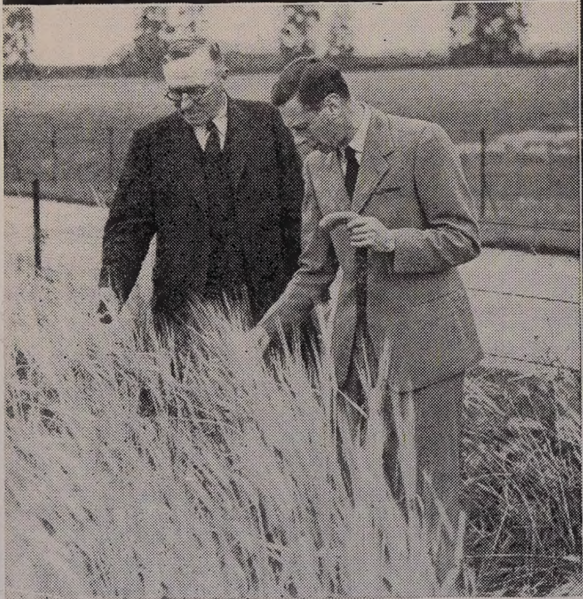
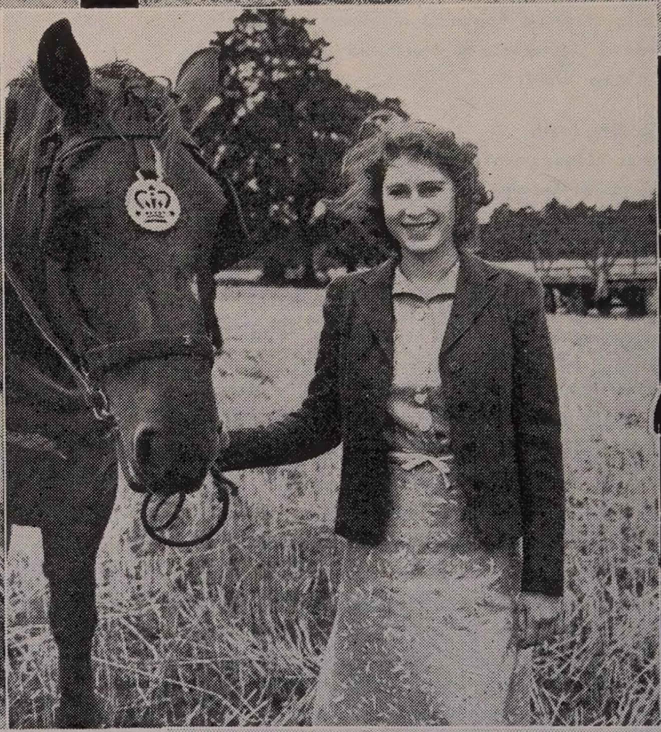
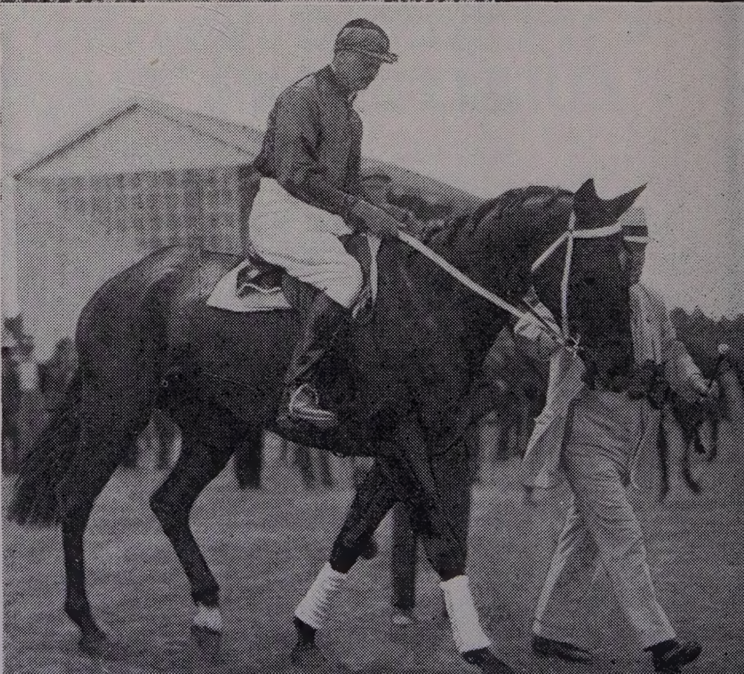
ROYAL INTEREST IN FARMING







In taking a keen interest in all branches of farming and in livestock Her Majesty Queen Elizabeth and other members of the Royal Family are following a tradition long established by previous Sovereigns. Farms were planned and developed by George III at Windsor in the 18th century, and Queen Victoria and Prince Albert later made Windsor not only a centre of stock breeding but a testing ground for new methods of agriculture. During the Second World War, when the production of food was vitally important, the Queen was able to appreciate through the efforts of her father, King George VI, the magnificent response made by British farmers to the call for greater output. Three of the photographs on this page depict Royal farming during that period and show at top right the Queen, then Princess Elizabeth, and Princess Margaret on the platform of a combine harvester gathering the barley crop at Sandringham, at middle left King George VI examining a good crop of barley at Windsor, and at middle right the Queen with one of the horses on the home farm at Sandringham. This month's cover, a replica of which appears at top left and which marks the beginning of the Queen's tour of New Zealand, shows her patting a horse at the Royal Windsor Horse Show in Britain last year and chatting with one of the competitors. The last Royal visitor to New Zealand was the Duke of Gloucester, who is shown on the right mounted at the Marton racecourse before taking part in the running of the Ladies' Bracelet on New Year's Day in 1935. The Duke of Gloucester owns Barnwell Manor Estate in Northamptonshire, a farm of about 550 acres the buildings on which are probably the most modern in Britain.



The Royal Family and Commonwealth Agriculture

PRIMARY producers will have awaited with as much eager anticipation as any other section of the community the visit of the Queen and the Duke of Edinburgh to New Zealand. The tendency for New Zealanders to think of and refer to Great Britain as Home is nowhere more pronounced than in our older settled farming districts, for it is here, where communities tend to be more stable than in the larger towns and cities, that the traditional links with the Britain that was the real home of many first generation pioneer settlers are proudly and firmly maintained.

It would be appropriate if the Queen's visit were to remind us of the great debt British agriculture (and therefore our own farming, which is so largely established on the foundations laid by settlers from the United Kingdom) owes to the Royal Family, which, since the farming activities of George III earned him the affectionate title of "Farmer George", has held up to British farmers a faithful example of good husbandry throughout the generations.

Influence of George III

To anyone with an interest in agriculture the picture of George III, the ideal of a country gentleman and an enthusiastic practical farmer who loved to contribute articles signed "Ralph Robinson" to Arthur Young's periodical "The Annals of Agriculture", cannot but be an endearing one.

At the time of his accession in 1760 great changes in farming were beginning. The traditional methods practised for centuries had long been criticised. The stimulus and example of their Monarch won the support of landowners in trying out the new methods prescribed in books the farmers would not or could not read.

The King himself did his best to turn Windsor Castle into a huge farmhouse and its grounds into farm lands. He found his greatest happiness in farming talk, reading farming books, and superintending the care of his bullocks. He transformed Great Park from a swampy wilderness to two model farms.

His example stimulated improvement in national farming in the late 18th and early 19th centuries—on the eve, as it were, of expansion of the British Empire to those countries, particularly Australia and New Zealand, to which traditions of British farming were so successfully transplanted.

Queen Victoria, almost from the inception of the Royal Agricultural Society in England, became its patron. The Prince Consort was at least as enthusiastic a farmer as George III and added to the properties of the Royal Family so widely and improved his purchases so much that it is claimed that an account of the work done on the Royal Farms during the 20 years of the Prince Consort's control would be a history of agricultural improvement of all the soils of England in that period.

When the Prince of Wales became Edward VII the interest in agriculture developed in him as a child continued. The Royal Farms remained examples of the best type of farming for their situation, soil, and climate.

N.Z. Reliance on British Breeds of Livestock

As a country so largely dependent on livestock products New Zealand has relied from its first settlement on British breeds of livestock for the establishment and the maintenance of quality of its flocks and herds. It is in this branch of farming that the Royal Family's influence has been particularly marked and the records of the premier British agricultural societies are full of their names. Most of us will have affectionate memories of pictures taken of the late Kings George V and VI inspecting some of the high quality livestock bred on the Royal Farms.

An account of what is being accomplished on the Royal Farms today would make impressive reading, for there is scarcely a branch of agriculture that is not affected. In their management exacting standards are set calling for a high degree of efficiency from staffs. There is a constant seeking to make the best use of modern agricultural practices to satisfy the increasingly urgent national need for increased food production.

The outstanding achievements in agriculture taking place throughout the British Commonwealth owe much to the Royal example, which inspires all engaged in this great industry to greater efforts.

With a long tradition of the Royal Family's association with agriculture the Queen will be an interested and intelligent observer of our own rural scene. As far as possible the itinerary of the Royal Visit has allowed for the Queen and the Duke to see typical aspects of our agricultural industry whose efforts in the production of food for Britain have so frequently received the commendation of the Royal Family.

The culmination of the rural community's association with the visit will be at the Royal Show in Invercargill, where I feel sure the Queen and the Duke will be thoroughly at home and where they will receive overwhelming evidence not only of the great affection in which they are held by the farming community, but of the very sound lines on which the traditions of British agriculture are being carried on in this country.

K. J. HOLYOAKE, Minister of Agriculture

Oversowing and Topdressing of Southern Hawkes Bay Hill Country

MUCH of the hill country of southern Hawkes Bay has been grassed, but through deterioration, brought about largely by economic conditions, a great deal has reverted to low-fertility grasses and some scrub. Improvement depends on introducing better species, particularly clovers, into the swards, more general use of phosphatic fertiliser, and a better appreciation of stock management on such country. In this article L. H. Alsop, Fields Instructor, Department of Agriculture, Dannevirke, discusses application of these methods of improvement in the district.

OF the 900,000 acres in southern Hawkes Bay, consisting of Akitio, Weber, Dannevirke, Woodville, and Pahiatua Counties and the Porangahau portion of Patangata County, the greater part is hill country. This has wide variations in climate and soil fertility, the main divisions being as follows:—

1. **Easy rolling areas of reasonably good fertility:** These respond well to topdressing and oversowing of all species of clovers. The climate is usually favourable for the establishment and maintenance of pasture.

2. **Easy rolling to steep areas of low fertility:** For this country it is important to select the species of clover most suitable for the conditions. Particular care should be taken to sow at the correct time to ensure a good strike. An adequate supply of fertiliser must be provided over the first 2 years, with subsequent management to ensure establishment and reseeding to allow for further strikes if climatic conditions are adverse.

3. **Wet, cold gullies on steep faces with a southerly aspect:** The chief requirements in this country are selection of suitable species, the application of fertiliser, ability to graze pasture down to the required length for oversowing, and good subsequent grazing management. Here a species demanding low fertility such as *Lotus major* can be used very successfully.

Climate

The annual rainfall varies from 38 to 42in. along the coastal belt and on the lower hill country areas, and increases to 60 to 80in. on the foothills and the higher ranges.

Distribution of rainfall is fairly even in late autumn, winter, and early spring, but long dry spells are not uncommon during summer and early autumn.

Frosts along the coast do not cause concern, but those experienced during late autumn and early winter inland and on the higher areas can have an adverse effect on germinating clover.

Importance of Clovers

Many of the hill country swards consist of some crested dogstail, considerable sweet vernal, browntop, chewings fescue, and danthonia, and some ratstail, flat weeds, moss, fern, and scrub. Traces of volunteer white, suckling, striated, and clustered clovers are the only legumes. It is only by the introduction of higher-producing white, red, and subterranean clovers and *Lotus* species that improvement to the grasses can be achieved and phosphatic fertilisers utilised efficiently.

The natural phosphate deficiency of the hill country is one of the most important factors limiting pasture growth. Before increased production on these areas can be expected phosphates must be added so that the higher-producing species will have a more reasonable chance of survival.

Although there is need for phosphate on most of the hill country, disappointing results from topdressing have occurred too often, as the application of phosphates on grass alone is virtually wasted. Topdressing on hill country must accompany oversowing to ensure more success for expenditure.

When thriving clovers appear in any sward it is an indication that improvement is taking place.

Most Suitable Species

On most soil types a well-distributed rainfall will contribute considerably toward the success of oversowing, but with variable climatic and fertility conditions consideration must be given to a choice of the most suitable pasture plants. Fortunately in most parts of southern Hawkes Bay it is possible to introduce species such as white, Montgomery red, and subterranean clovers, or *Lotus major* and *Lotus hispidus*. Over many areas these can be sown successfully in mixtures or as single species.

To determine the right species a knowledge of the fertility and moisture requirements of the individual clovers is essential. These are as follows:—

HEADING PHOTOGRAPH: On this farm improvement work to hill country has been carried out by oversowing and topdressing and also by sowing down new pasture after cultivation with giant discs. By this method the carrying capacity has been raised from 1.7 ewe equivalents per acre to 3.1 ewe equivalents since 1947.

White Clover

White clover, a perennial, is undoubtedly the most important clover in New Zealand. Given suitable treatment it can thrive under a wide range of conditions. Greatest value can be derived from it when it is grown on well-drained, high-fertility soils, but even under less favourable conditions it fills a very important place in New Zealand pastures. Factors limiting growth are dry conditions, lack of available phosphate and potash, overgrazing, lack of drainage, or too high soil acidity.

White clover is the most prolific nitrogen-fixing legume in New Zealand pastures, and it will also derive the greatest benefit from an adequate supply of phosphate.

Subterranean Clover

Subterranean clover depends for its survival on its prolific reseeding. It thrives on free soils and produces the greatest amount of herbage of all the annual species. It should not always be looked on as the ultimate species in the sward, but should be regarded as a stepping stone to the establishment of white clover where there is enough moisture for this to remain permanent. In areas of low rainfall subterranean clover is best, and its annual habit makes it invaluable in areas of summer droughts.

Red Clover

Red clover is a perennial plant, but it will not stand up to hard grazing as well as white clover. Its fertility requirement is somewhat lower than that of white clover and its capacity to fix nitrogen is also less. The growth which this clover makes in late spring and early summer, however, makes it a valuable legume in hill country pastures.

Lotus major

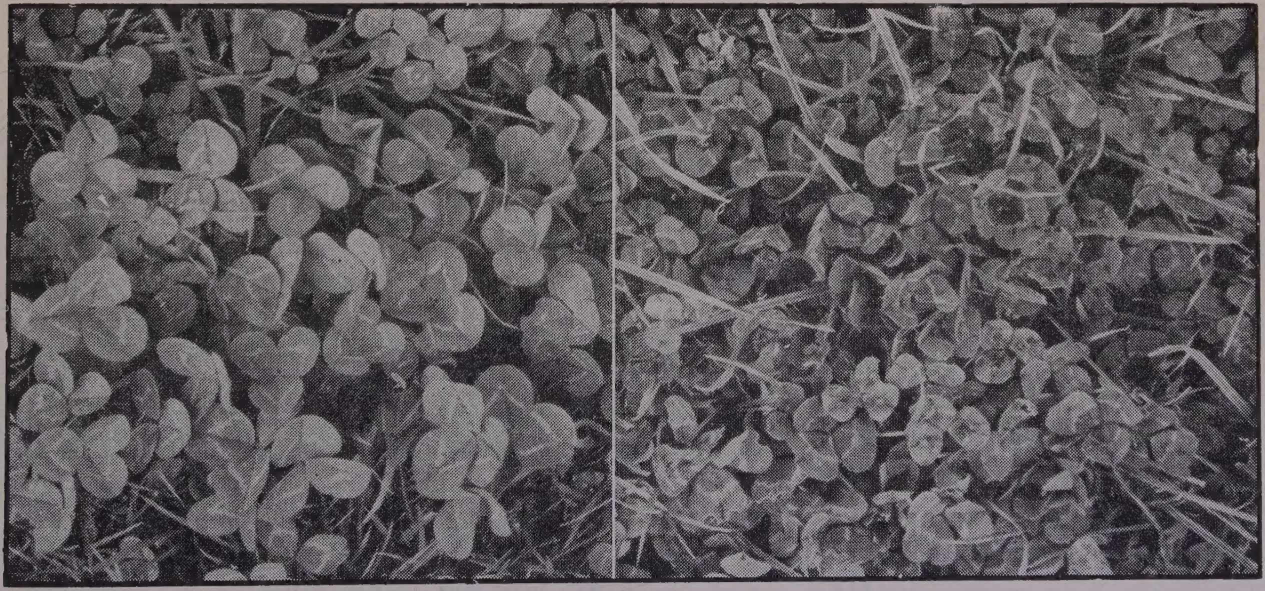
Lotus major is a perennial the value of which is not generally recognised by farmers. It is a species demanding low fertility and thrives on cold, damp areas where other clovers will not produce efficiently. Once established it will persist and spread even without regular phosphate dressings. Trials throughout southern Hawkes Bay have shown that it establishes slowly, ultimately filling an important role in the improvement of those areas which are too cold and wet for successful subterranean or white clover establishment.

Danthonia and browntop pastures are typical of much of southern Hawkes Bay.

Establishment of Clovers

Trials in southern Hawkes Bay to determine the most suitable time for oversowing showed that autumn gave a more favourable response than spring. March proved to be the best month and April the next best. Of the spring sowings, that in September was comparable with late May sowings. It may, however, be possible or even advisable to sow in the colder, wetter districts during spring.

When the correct time to sow is being decided, consideration must be given to the climate. Sowings should not be made until regular autumn rains have begun, which will not only germinate the seed but also maintain the young, growing plants. Early autumn (February) sowings may be subject to light showers sufficient to germinate the seed, but the seedlings may succumb to following hot, dry weather or seed may be eaten by birds if left lying on the ground ungerminated for too long. Late autumn sowings go into the winter as small plants, and seedlings may be destroyed by frosts or pests. When oversowing is being done with subterranean clover in spring it must be remembered that this species is an annual which barely becomes established before summer



Clovers introduced by oversowing on hill country in Akitio County. Left—White clover. Right—Subterranean clover. Since 1948 this area has received 1 ton of lime per acre and a total of 8cwt. of superphosphate per acre.

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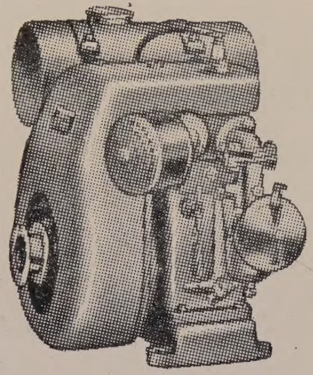

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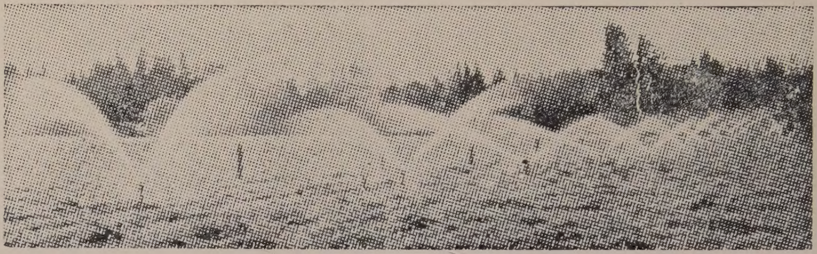

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droughts, which may cause premature death, often without reseeding.

Seeding Rates

In oversowings the losses in seed that does not germinate or is damaged and destroyed must, of course, be much greater than if the seed were sown on cultivated ground. It is very important that such factors as soil fertility, seed mixture, and temperature be considered when a seeding rate is being decided. The whole aim of the operation is to establish rapidly a suitable clover species in the pasture. On higher-fertility country 3lb. of seed per acre is adequate, but when conditions are such that a 50 per cent. loss in establishment can be expected the seeding rate must be increased to aim at a germination comparable to approximately 3lb. per acre.

Condition of Pasture at Oversowing

Trial results have been sufficiently conclusive to show that the pasture should be grazed short before oversowing so that the seed can reach the soil surface and yet have enough cover to protect the establishing seedlings. A management programme to open up the bottom and to cut up the soil should be carried out before sowing. Cattle are recommended in preference to sheep, as the heavier animals will tend to stir the soil surface with sharp hooves, leaving a suitable bed for the germination of the seed. The following points are important to ensure that as many seeds as possible establish:—

The seed must be able to fall on or very close to the soil.

The germinating plants must have light, air, and moisture to establish.

Sufficient cover to protect the plants in the cotyledon stage is desirable.

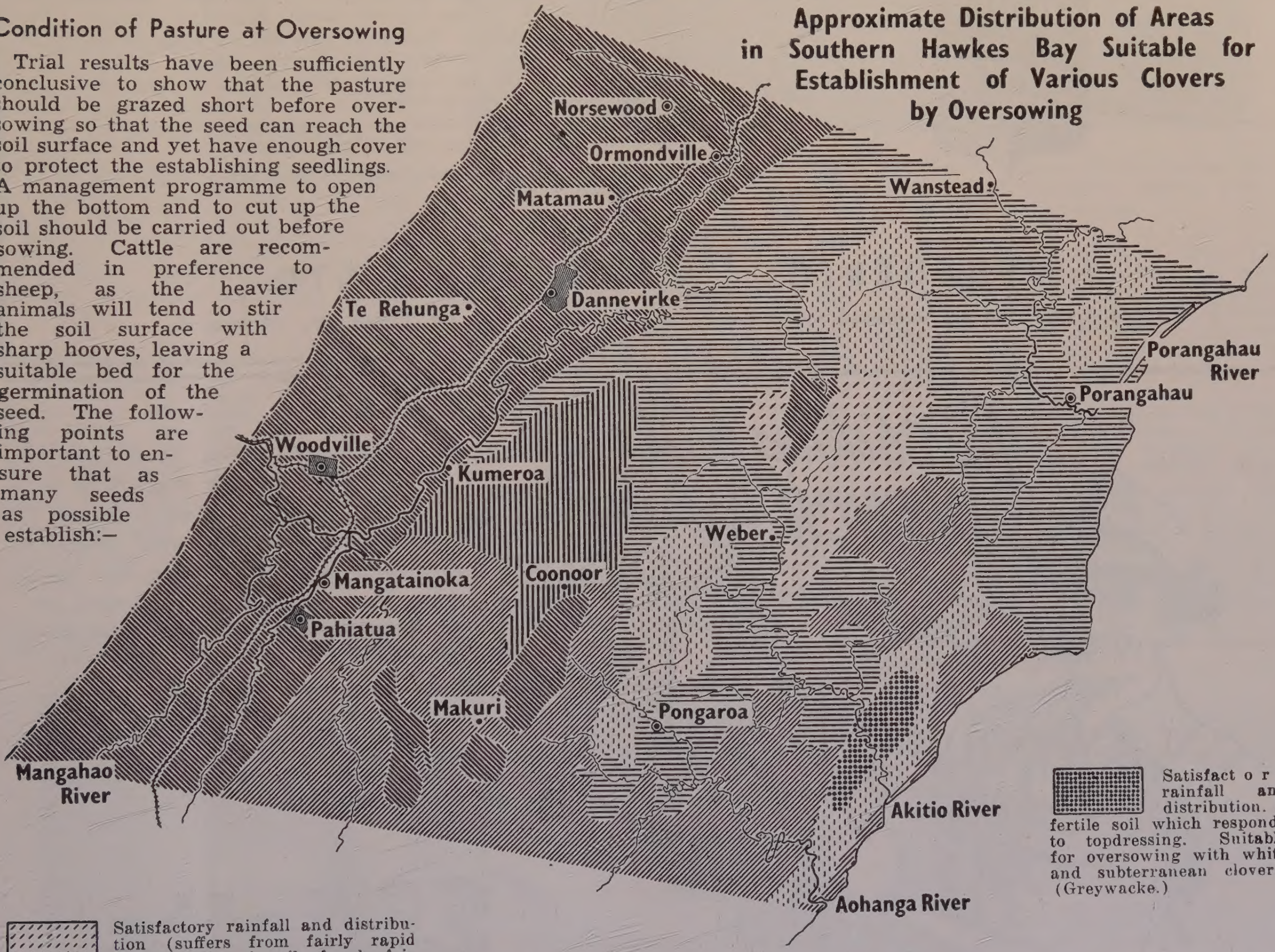
Too much cover will have a suppressing effect on the growing plants.

Too much cover will also tend to force the plants to grow long stems, with the result that at the first grazing the plants are often eaten off below the crowns and do not recover.

Management after Sowing

It is advisable to remove all stock while the seeds are germinating, usually a period of from 4 to 6 weeks. After this little damage can be done other than by extreme undergrazing or overgrazing. The rank growth often experienced during late autumn and early winter will do as much harm to the young clover seedlings as extremely close and continuous grazing. The first grazing should be carried out with a big mob of sheep so that the area can be grazed off quickly and then spelled again for a further 3 to 4 weeks. This type of management should be continued until the clover is well established with a vigorous appearance. At no stage should close grazing be permitted, as this will have a detrimental effect on root growth and development. The greater the root penetration and development that can be encouraged by on-and-off grazing and by not grazing too close to the soil surface, the greater will be the return from pasture production.

Approximate Distribution of Areas in Southern Hawkes Bay Suitable for Establishment of Various Clovers by Oversowing



▦ Satisfactory rainfall and distribution. A fertile soil which responds to topdressing. Suitable for oversowing with white and subterranean clovers. (Greywacke.)

▨ Satisfactory rainfall and distribution (suffers from fairly rapid drying out). A soil of only fair fertility which responds to regular topdressing. Suitable for oversowing with lower fertility demanding clovers such as subterranean clover. Some of the more fertile pockets are suitable for white clover. (Stony silt loam overlying argillite.)

▤ Satisfactory rainfall with poor general distribution, but good during autumn and spring. A fertile soil which responds to topdressing. Response to oversowing with subterranean clover is very good and white clover will establish. (Mudstone and mudstone over argillite, with greywacke interspersed throughout the area.)

▥ Adequate rainfall, satisfactorily distributed. A fertile soil which responds well to topdressing. Suitable for oversowing with white and red clovers and *Lotus major*; subterranean clover on the harder faces. (Sandy mudstone and sandstone.)

▨ Satisfactory rainfall and distribution. A moderately fertile soil which responds to topdressing. Suitable for oversowing with white and subterranean clovers and *Lotus major*. (Mainly banded mudstone and sandstone.)

▧ Adequate rainfall, well distributed. A fertile soil which responds well to topdressing. Suitable for oversowing with white and red clovers, with *Lotus major* added on the colder faces.

░ Satisfactory rainfall, but poor distribution aggravated by strong drying winds and a porous soil. Fertility is poor. Suitable for oversowing with subterranean clover (at higher rates than usual) with *Lotus major*; clustered and striated clovers on the poorer areas. (Mainly argillite with very shallow soil.)

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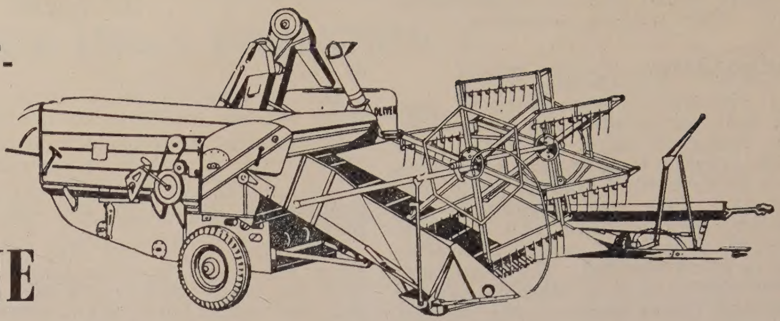

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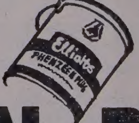

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Selecting the Area

Selecting the area to be improved is probably one of the most important yet least considered aspects of hill country improvement. Though it is good policy to encourage oversowing and topdressing, it is also sound to see that money spent on this aspect of development is not wasted.

Farmers generally tend to oversow too large an area at once, often with the result that the management policy of that particular area becomes a problem in the over-all grazing of the farm.

An important consideration is what area can be managed efficiently at a time and how much phosphate will be available to ensure that the area can receive dressings adequate for healthy and vigorous establishment. Management must allow for vigorous, well-rooted plants, and reseeding must also be allowed to obtain a high concentration of seeds in the ground. After this has been achieved there should be little cause for concern. However, it is only by selecting areas where stock movement at sowing, during establishment, and at reseeding periods can be controlled that this can be achieved. Furthermore, an improvement programme should always concentrate on the better land first. To endeavour first to raise the level of the poorer country to that of the better areas is unsound. Rather should the better land be made to produce at a higher level before an attempt is made to increase production on poor back areas.

Hill country in southern Hawkes Bay, much of which is capable of improvement by topdressing and oversowing. The topography of some of the country enables it to be worked up by giant discs and sown to good pastures.

Fertilising

On the hill country the essential fertiliser is phosphate. The normal topdressing practice on the hill country is to sow 1½cwt. per acre, but when clovers are being oversown this is not sufficient. A dressing of 3cwt. per acre at least is advised to establish a vigorous, high-producing clover on low-fertility areas, and it is important that regular applications be applied for not less than 2 years.

When the supply of fertiliser and means of application are adequate, application of four 3cwt. dressings in the first 2 years has proved advantageous. This is done by applying the first dressing with the seed, followed by a further application in spring, 3cwt. more the following autumn, and the fourth dressing 12 months later. This may appear to be somewhat expensive on poor hill country, but the aim of the operation is to create a fertility level capable of supporting the higher-producing clover species.

Where finances are limited the farmer should endeavour to select a smaller area where a programme as described could be carried out rather than to reduce the rate of application. The frequency of phosphate application is most important and should receive careful thought. Many hill country farmers are attempting to cover the whole of their properties with dressings of up to 2cwt. per acre as quickly as possible. Frequently this fertiliser is going on to ground either devoid of clovers or on areas containing only poor volunteer species.

Liming

With long hauls, high carting costs, and difficulties of spreading, liming has not received much support from farmers in many back country areas.

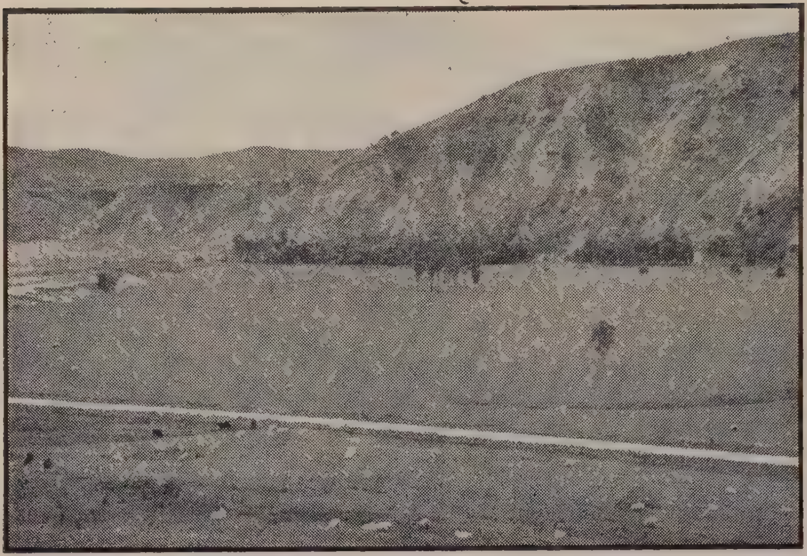
Whenever it has been carried out, however, it has shown that most of the hill soils will benefit from a dressing of 10cwt. or 1 ton per acre. Whether to lime or not is mainly an individual problem based on locality, topography, availability of spreading equipment, and costs of application. Where it can be carried out economically it can well be recommended.

Grazing Management

The improvement of all pastures is closely related to grazing management. Where lower-fertility conditions exist it is even more essential that this factor should receive careful consideration. Controlled grazing, in addition to oversowing and regular topdressing, will result in a substantial increase in over-all production on even the poorest of farms.

Most farmers are familiar with the term "rotational grazing" and practise it to some degree, but often a more intensive system based on the pasture's capability would give much greater returns. It is desirable that each paddock be assessed as to its ability to meet the demands of the feeding animal without damage to the existing sward. This can be done only by ascertaining how long a mob can be grazed on each area during the seasonal fluctuations. Paddocks vary considerably in herbage production and in their ability to recover after grazing by a large mob. Assessment based on size of paddocks is not always a sound method, but too often

On the hill country of southern Hawkes Bay the essential fertiliser is superphosphate. Here superphosphate is being applied with a blower.



The aeroplane has enabled considerable areas of hill country to be topdressed and oversown. This drained river flat in Akitio County is used as an airstrip.

it is the size of the area instead of the pasture's capability that determines the carrying capacity. From this, overgrazing and undergrazing often result.

Trial work has shown that a policy of on-and-off grazing, allowing for periodic spelling, gives greater production. A greater concentration of fertiliser in a form readily available to plants is deposited by the animal. Selective grazing is kept to a minimum by the use of large mobs of animals, thus keeping down the tall, rank patches which indicate unproductiveness. A better control of clover growth is obtained through prevention of smothering or damage by too close grazing, both of which cause premature death.

Example of Land Development

The following example shows how by the application of these methods improvements can be achieved by topdressing and the introduction of suitable clovers.

A farmer took over a property of 609 acres in March 1947. The carrying capacity at that time was 750 ewes, 184 hoggets, 13 rams, and 78 cattle; the wool weight for 1947 was 10,332lb.

The pasture consisted mainly of browntop, danthonia, crested dogstail, Yorkshire fog, sweet vernal, and some subterranean clover, with suckling clover predominating. Weeds in varying amounts were cudweed, field daisy, rushes, dandelion, Scotch thistles, mouse-eared chickweed, fern, manuka, and moss.

In 1947 a pasture-improvement programme was begun, the aim being first to build up fertility by topdressing and then to introduce suitable vigorous clovers.

The programme from 1947 was as follows:—

1947—topdressed the whole farm with 2cwt. of phosphate.

1948—topdressed the whole farm with 2cwt. of phosphate.

1949—topdressed the whole farm and oversowed 80 acres with 2lb. of white clover and 2lb. of Mt. Barker subterranean clover per acre.

1950—topdressed 300 acres and oversowed 170 acres with 2lb. of white clover and 2lb. of subterranean clover per acre.

1951—topdressed all the farm and oversowed 180 acres with the same mixture.

1952—topdressed 60 acres and oversowed 60 acres.

1953—topdressed 60 acres and oversowed 60 acres.

Carrying capacity and wool weights have responded as set out in the table below.

Year	Ewes	Hoggets	Dry sheep	Cattle	Wool weight
					lb.
1947 ..	750	273	13	78	10,332
1948 ..	808	315	37	50	11,885
1949 ..	883	288	56	81	13,227
1950 ..	751	527	61	64	*11,639
1951 ..	868	390	90	56	14,063
1952 ..	908	440	13	115	14,724
1953 ..	950	570	20	153	†15,000

* The decrease in wool weight in 1950 occurred during a change-over in flock management.

† Estimate.

During the above periods there has been a marked improvement in carrying capacity with wool weights continuing to rise steadily, following the combining of oversowing with topdressing.

It should be noted that the owner oversowed practically all his farm in 4 years. This is not usually advisable, but in this case the owner was able, through the original fertility build-up by topdressing and increased stocking, to make progress fairly rapidly. By maintaining a sound management policy of reseeding and mob stocking, and by watching closely that establishing plants were not grazed too severely, the farmer carried out this progressive programme successfully.

Future Improvement Possibilities

Of the total area of southern Hawkes Bay, 750,000 acres could be classified as hill country capable of still further improvement. Of this, some areas are suited for improvement by cultivation; others are in the process of improvement by oversowing and topdressing but have not yet reached full potential production.

With the fluctuation in seed prices and local variations in cartage rates it is difficult to give figures that will be applicable in general, but the following example of a complete programme carried out on 20 acres of a farm at Pongaroa, about 40 miles from Dannevirke, will serve as an indication of what it costs to develop land.

Initial Oversowing Costs for 20 Acres

	£	s.	d.
2lb. of white clover per acre	8	0	0
1lb. of Mt. Barker subterranean clover per acre ..	4	0	0
1lb. of Tallarook subterranean clover per acre ..	5	10	0
3 tons of superphosphate at 3cwt. per acre ..	29	9	6
Cartage of 3 tons of superphosphate—			
From Wanganui to Dannevirke at 28s. per ton ..	4	4	0
From Dannevirke to Pongaroa at 36s. per ton	5	8	0
Spreading costs, approximately £2 per ton ..	6	0	0
	£62	11	6

Subsequent Topdressing Costs

	£	s.	d.
3 tons of superphosphate ..	29	9	6
Cartage	9	12	0
Spreading	6	0	0
	£45	1	6

On the above costs the original seeding and two subsequent dressings would cost £152 14s. 6d. or under £8 per acre. Farms closer to a railhead would be developed for less, depending on cartage costs.

Further improvement to warrant expenditure could be computed as follows:—

If it is assumed that untreated country would carry 1½ sheep, treated country could be expected to carry at least 3 sheep, giving an increase of double the original carrying capacity. By careful management this state should be achieved after the completion of the oversowing and topdressing programme. Therefore, the first 3 to 4 years' extra profit is taken up in paying for the original outlay. From this point, however, the added income is available for further improvement on other areas. Furthermore, with more stock a greater build-up of fertility is taking place through the movement of stock from improved to unimproved areas. More and higher-quality wool will be clipped, better lambing percentages can be looked for, and more lambs fattened. As further areas are made more productive an over-all increase in meat and wool will result.

Of more importance to the farmer, these methods will be the means of ensuring a better standard of living for him and his dependants, and he knows that when he retires he has left the land more fertile than it was when he began.

Blackleg or Blood Poisoning of Sheep and Cattle

BLACKLEG, a disease of sheep and young cattle, has been responsible for much economic loss to the animal industry of New Zealand. In the early part of the 20th century it caused great losses in young cattle in the North Island until it was satisfactorily controlled by regulatory measures enforced by the Animal Industry Division of the Department of Agriculture. This disease in sheep has caused great losses in flocks in all districts of New Zealand, some of the most severe outbreaks being recorded in the southern half of the South Island. One of the difficulties of control is the ability of the blackleg bacteria to exist almost indefinitely in the soil in the form of very resistant spores. This article by M. C. Armstrong, Veterinarian, Department of Agriculture, Timaru, describes the predisposing causes, symptoms, and post-mortem signs, and the procedure for accurate diagnosis, and sets out the methods of control by vaccination and management.

Because of the risk of blackleg infection from contaminated soil it is wise to regulate the size of breaks of winter feed so that sheep are on each break for only 7 days.

BLACKLEG is a fatal bacterial disease of a blood poisoning nature caused by *Clostridium chauvoei*, a micro-organism belonging to the gas gangrene group, which also includes the bacterium responsible for tetanus (*Clostridium tetani*) and that responsible for pulpy kidney (*Clostridium welchi*).

The bacteria multiply and thrive in animal tissues in the absence of oxygen and produce spores which can remain alive in the soil for many years because of their very resistant nature.

Incidence in Cattle

Blackleg was first identified in New Zealand as the cause of deaths in young cattle in Taranaki in 1889. The veterinary staff of the Department of Agriculture discovered that the spores of this disease had been imported in unsterilised bone manure from India. Within 10 years the disease had spread rapidly in Taranaki and had appeared in the Auckland Province, causing big losses in young cattle. In 1903 blackleg in cattle became a scheduled disease declared notifiable under the Stock Act and the importation of unsterilised bone manure was prohibited. The affected areas of Taranaki and Auckland were declared quarantine areas for young cattle, and the movement of cattle under 18 months of age was prohibited unless the stock were vaccinated within 7 days of removal. The blackleg regulations also provided for the annual vaccination and branding of calves and the adequate disposal of carcasses in the infected areas.

Blackleg in cattle has been satisfactorily controlled to such an extent that the disease is no longer scheduled under the Stock Act. Though the disease in cattle is almost entirely confined to Taranaki and Waikato, cases have been confirmed from all districts in the North Island except Poverty Bay. The South Island has remained free from blackleg in cattle except for one outbreak near Christchurch in 1952.

Incidence in Sheep

Since the early days of farming blood poisoning in sheep has been a major cause of mortalities associated with shearing, crutching, dipping, lambing, lamb marking, travelling, and winter feeding. Sheep flocks in all areas of New Zealand have been affected.

Until recent years the infection had been regarded as malignant oedema, which is a close relative of blackleg and is caused by *Clostridium septique*. The early investigations were carried out by J. A. Gilruth, Chief Veterinarian of the Department of Agriculture, and in 1893 a leaflet for farmers was issued titled "Blood Poisoning (Malignant Oedema) in Sheep". During more recent years, however, research workers of the Animal Research Division of the Department of Agriculture have discovered that about 90 per cent. of all blood poisoning in sheep is caused by the blackleg bacterium *Clostridium chauvoei* and that the malignant oedema bacterium, *Clostridium septique*, is of minor significance. Occasionally both germs will be found together in a mixed infection. The probable existence of a sub-type of *Clostridium chauvoei* that is infective only to sheep is indicated by evidence that blackleg in sheep is very prevalent in the South Island on farms where young cattle remain healthy. Nevertheless, the vaccine prepared for blackleg in cattle is also effective for sheep.

Predisposing Factors and Symptoms

In Cattle

The disease usually affects young cattle (between 4 months and 2 years of age). Only young cattle are susceptible and it is unusual to find any affected under 3 months of age or over 18 months. Rare cases have been confirmed in cattle up to 4 years old. The best-conditioned calves are more susceptible and poor-conditioned calves are resistant.

It is assumed that calves are infected by the ingestion of spore-contaminated soil. After the spores are absorbed into the muscle tissues from the digestive system the damaging effects on tissue by injuries or parasites may allow the spores to germinate and establish the disease.

The first symptoms in cattle are lameness combined with very definite signs of sickness; the animal is dull, fevered, and off its feed, and stops chewing the cud. Swelling of one forequarter or one hindquarter occurs and the animal dies quickly after the first symptoms appear. At times the swelling may develop on other parts of the body such as the neck, brisket, loin, or flank. On palpation, the skin of the swollen part is tense and the underlying tissues crackle owing to gas bubbles. If the swelling is incised, the tissues are dark and exude a brownish-red, frothy fluid. There is generally no evidence of any wound in the skin.

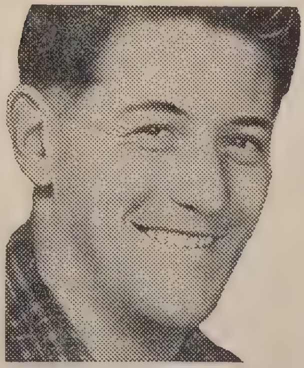
In Sheep

Blackleg affects sheep of all ages from new-born lambs to old ewes and rams.

On sheep farms the disease spores are more numerous in the soil of older pastures and around well-used sheep yards. As with cattle the spores can be picked up by mouth and lodge in muscles, where they remain dormant. The bruising of spore-infected muscles may precipitate the disease in sheep after operations such as dipping, shearing, crutching, lambing, and mustering.

The disease commonly occurs in sheep after contamination of wounds by soil-borne spores. By this method of infection blackleg may cause losses from navel infection in new-born lambs, in rams after fighting, and from the contamination of wounds inflicted during shearing, dipping, lambing, lamb marking, and other operations.

Blackleg losses, especially in young sheep, have been common in the South Island during winter feeding of crops such as turnips and chou moellier. The worst losses occurred in hoggets that were feeding for long periods on large breaks of a crop and where the



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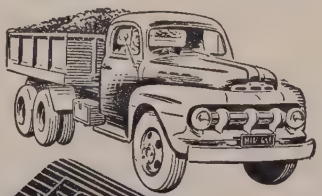

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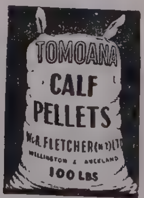


intake of food would contain much soil infected by blackleg spores. Under these conditions the sheep may die without symptoms being observed. As similar deaths are also commonly caused by enterotoxaemia (pulpy kidney), it is important that expert assistance be sought to diagnose properly serious losses of this nature.

Affected sheep usually die in 2 to 5 days after infection starts. In the early stages the animal is listless, disinclined to move, and soon becomes recumbent. Signs of fever accompanied by rapid breathing and high temperature are manifest. The skin overlying the infected area of the body rapidly becomes bluish purple and the wool pulls out easily. The animal rapidly becomes comatose and the temperature drops below normal as death approaches.

Post-mortem Appearances

Rapid putrefaction after death, a foul-smelling odour of rotten meat, and the distension of the carcass with gas formation in the tissues under the skin as well as in the digestive tract are typical post-mortem findings of blackleg, but they are also usual for enterotoxaemia (pulpy kidney) of sheep.

Lambs dead from navel infection by blackleg will show some swelling and purplish discoloration of the skin around the navel, and an incision through the navel into the abdominal cavity will reveal a blackish-red zone of infected tissue extending inward to the liver.

Older lambs and sheep dead from infected skin incisions and wounds will show swelling and bluish-purple skin around the contaminated sites. The tissue swelling and purplish skin are apparent before death and in cases of ewes infected at lambing these signs may involve both hindquarters as well as the vulva.

Calves and sheep that have died from blackleg unassociated with skin cuts but due to the bruising of spore-infected muscles will show swellings and skin discoloration on various parts of the body, depending on where the susceptible tissue is diseased.

Palpation of the diseased tissue gives the sensation of sponginess, swelling, and crackling or crepitation of the gassy material under the purplish area of skin. The dead animal usually has some blood-stained froth at the muzzle. Incision of the infected tissue after death will show swollen, dark muscles exuding reddish-black fluid containing tiny gas bubbles.

The blackleg bacteria are liberators of powerful poisons (toxins) that kill and cause rapid putrefaction after death.

Diagnosis

The presence of blackleg can be accurately determined by the application of laboratory tests to suitable specimens. A diagnosis can be confirmed by the inoculation of guinea pigs or mice with a suspension made from infected material and the subsequent identification of the bacteria in the dead experimental animal. Investigators usually submit for diagnosis one or two ribs from a recently dead sheep or a limb bone from a cattle beast and also several portions of affected muscle in separate containers with no preservatives added.

Farmers who experience troublesome losses in livestock should consult a Veterinarian or Livestock Instructor of the Department of Agriculture.

Treatment of Infected Animals

Before the introduction of the sulphonamide drugs and penicillin the treatment of blood poisoning was seldom successful. Penicillin injections have proved valuable in special circumstances where prevention by vaccination has not been undertaken. A convenient method for the intramuscular inoculation of penicillin is provided by the use of a 500,000-unit collapsible tube (obtainable on a veterinary prescription) to which a suitable hypodermic needle can be secured. Where ewe flocks have not been vaccinated against blackleg and where losses from blood poisoning have occurred in the early lambers one tube of 500,000 units of penicillin should be injected intramuscularly at once into each ewe which has been given assistance with lambing and this dose should be repeated at 24-hour intervals if necessary. The same treatment can be applied for early cases of blood poisoning from causes other than lambing.

The treatment of the disease in unvaccinated cattle should be left to the discretion of a veterinary surgeon, because dose rates and drugs vary for varying sizes of animals and severities of infection. In infected districts any calf showing lameness should be promptly isolated and carefully examined.

Prevention by Vaccination

The vaccination of all sheep and calves is the most effective single method of prevention where blackleg or blood poisoning is likely to cause losses.

Calves

Vaccination of calves has been done since 1900 and at one time it was compulsory in infected districts. At present the use of vaccine for calves is largely confined to Taranaki, North Auckland, Auckland, Waikato, and King Country. Considerably less vaccination is done in Rotorua, Bay of Plenty, Hawkes Bay, and Wanganui districts. There is no regular vaccination of calves against blackleg in the South Island.

Young cattle are generally vaccinated with a dose of 5 millilitres (c.c.) at 2 to 5 months of age during October to January in the intensive dairying areas. The vaccination charge is now 2s. per head, and application for vaccination should be made to the Department of Agriculture or to a Veterinarian.

Sheep

Since blackleg infection in sheep was first diagnosed definitely in New Zealand in 1939 very valuable research on vaccines and their immunising powers for sheep has been undertaken by the Department of Agriculture's Wallaceville Animal Research Station. Improved types of vaccines have been evolved, the latest of which is an alum-precipitated vaccine prepared with a greatly improved culture medium. The result is a vaccine at least 100 times as potent as its predecessor. Blackleg vaccines for sheep can be purchased commercially.

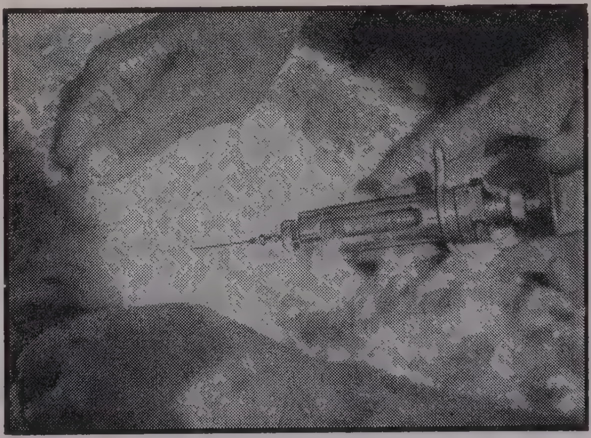
Recommendations for the vaccination of sheep are as follows:—

Hoggets: Where losses occur during winter feeding, hoggets should be given 5 millilitres (c.c.) of vaccine 2 or 3 weeks before going on to winter feed crops. If ewe hoggets are vaccinated, they must be given another 5 millilitres (c.c.) of vaccine when they are 2-tooths so that they will be protected at their first lambing. This is necessary because young sheep do not generate a lasting immunity.

Ewes: Under general conditions the vaccination of breeding ewes at least 3 weeks before their first lambing is adequate to give protection for the remainder of their lives. The annual vaccination of all 2-tooth ewes and newly purchased unvaccinated ewes is sufficient to prevent blackleg on moderately affected farms. Breeding ewes of all ages should be done the first year and in subsequent years the 2-tooth replacements and purchased ewes should be vaccinated. Some time between tupping and 3 weeks before lambing 5 millilitres of vaccine should be given. This practice would protect breeding ewes of all ages against moderate losses from blackleg at lambing, dipping, crutching, and shearing, or when travelling.

On badly infected properties where severe losses in sheep of all ages are experienced consideration should be given for the annual vaccination of all sheep.

Lambs before or after marking: If navel infection is troublesome or if losses occur after marking, control can be obtained by the annual pre-lambing vaccination of all breeding ewes with 5 millilitres (c.c.) of vaccine. This should be done 3 weeks before lambing; the antibodies consumed in the ewes' milk will protect lambs up to 6



Vaccination behind the shoulder. The dose is 5 c.c. The wool has been parted and the skin lifted slightly, ready for the needle to be inserted subcutaneously with a light thrust.

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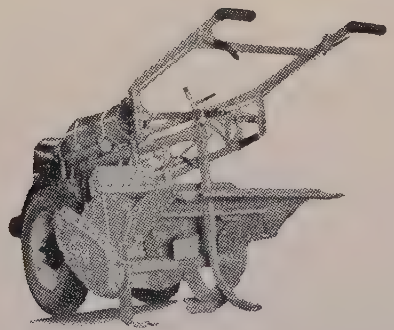

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weeks of age. Lambs should be marked before they reach that age.

Rams: On farms where losses in young rams can be expected after fighting the annual vaccination of rams with 5 millilitres of vaccine is recommended.

Vaccination Precautions

The following precautions are necessary to prevent losses after vaccinating sheep against such diseases as pulpy kidney, blackleg, tetanus, and black disease.

Sheep should be vaccinated in temporary yards on spelled pasture. Syringes and equipment should be sterilised by boiling them for 10 minutes in water. The piston should be removed from glass syringes before the syringes are boiled. Spare needles should be soaked in methylated spirit or 10 per cent. formalin and the needle should be changed frequently. The operator should protect the vaccine from dust contamination by withdrawing the vaccine direct from the bottle to the syringe via a rubber piercing stopper, or by using an automatic syringe, or by keeping the vaccine in sterilised covered containers.

The vaccine should be injected just under the loose skin but not into muscle. Ewes are usually vaccinated behind the shoulder when they are standing in a race. With the aid of an assistant the skin site is exposed, the skin slightly lifted, and the needle thrust on a slant just through the skin. A deep stab with the needle must be avoided to prevent vaccination losses caused by the activation of latent disease spores in damaged muscle. Vaccination should not be done when the skin is wet with running moisture. Dusty or muddy conditions should be avoided during vaccination.

[*National Publicity Studios*

Lambs should always be marked in temporary yards, preferably in a paddock where blackleg has not occurred.

[*Sparrow*

On some properties it is found that reducing the time mobs are held in yards to the minimum helps to reduce the incidence of blackleg.

Prevention by Management and Hygiene

Calves

Where young cattle could be infected any of them showing lameness should be isolated and frequently watched or treated as detailed above. Carcasses and all discharges should be promptly disposed of by burning or by burial to a depth of at least 3ft. A calf dead from blackleg or suspected to have died from the disease should never be skinned, but without delay should be deeply buried or burnt with the skin intact to reduce the spread of infected tissues and discharges by predatory birds and animals.

Sheep

The adoption of common-sense precautions, whether or not vaccination against blackleg is practised, is a very important way to cut losses in sheep from all types of blood poisoning, such as tetanus and septicaemia.

On winter feed: Losses in sheep on breaks of winter feed can be minimised by using divisions of the crop small enough to be eaten down in 7 days. This practice will also reduce the toll of internal parasites.

Shearing and other operations: To prevent disease associated with shearing, crutching, and other necessary work the shearing shed should be cleaned regularly before use by a thorough sweeping to remove all dust on the floor, then a washing of the shearing board and its immediate surroundings with 2 per cent. hot caustic soda or washing soda solution, and finally a spraying with a good disinfectant.

As much care as possible should be taken to keep wounds to a minimum and all skin cuts where possible should be dabbed with a reliable disinfectant. The use of a can of disinfectant for the frequent insertion of blades or cutters is a good habit.

Dust in nearby yards such as counting-out pens and races should be settled with water, and on heavily diseased farms the surface soil of yards and pens could be replaced by burnt lime.

The holding of sheep in yards after shearing or crutching should be avoided on properties where disease is prevalent.

Lamb marking: Procedures advised are the use of temporary yards in spelled pasture; sterilisation of instruments before beginning and regular insertion of the instruments in disinfectant after each operation; frequent settling of dust with water, and prompt disposal of all tails and testes after each session of lamb marking.

Lambing: Assistance for a high percentage of ewes at lambing time may be required in many flocks, and the need for satisfactory antiseptic precautions to prevent blood poisoning cannot be over-stressed. Clean hands, short finger nails, and the use of an antiseptic lubricant such as a mixture of liquid paraffin with a non-irritant disinfectant should be standard practice. Special care is required to avoid tearing or breaking the tissues of the genital tract. A ewe should never be assisted after a carcass has been handled unless the hands and arms have been thoroughly cleaned and disinfected. Ewes should be lambed in paddocks free from unfenced shelter belts and in paddocks that have the best history of freedom from blood poisoning.

Prompt Disposal of All Carcasses

One of the simplest ways to spread blackleg over farm lands is to leave carcasses lying about for hawks, seagulls, and other predatory birds and animals to scatter infected debris. As mentioned earlier, the spores of blackleg can live in the soil for very many years, and to cut down the spread of this and many other bacterial diseases more attention is necessary to see that dead animals are promptly burnt or buried to a depth of at least 3ft. With blackleg there is a rapid invasion of the bloodstream and a rapid saturation of the carcass by bacteria after death of the animal.

Livestock of Northern Counties ('000)

	1952	*Potential*
Cows in milk	319	693
Breeding ewes	608	1,650

Grassland Conference in Northland

By G. J. NEALE, Editor, Department of Agriculture, Wellington

LAND development in Northland dominated papers and discussions at the 15th conference of the New Zealand Grassland Association held at Whangarei early in November. "One of the two principal remaining pioneer fringes of New Zealand" was the description applied to the district by Mr. S. W. Smith, M.P., Parliamentary Under-Secretary to the Minister of Agriculture, in his opening address to the conference; and in mentioning the 798,000 acres of readily developable unimproved land in North Auckland today Mr. J. Bruce Brown, Lands and Survey Department, remarked that "somebody said recently that New Zealand was almost fully developed".

MOST of the papers at the conference dealt with specific aspects of grassland development in the North Auckland Peninsula and the agenda included visits to a town-supply dairy farm near Whangarei owned by the Mayor of Whangarei, Mr. W. H. James, and managed by his son-in-law and to a Lands Department development block at Puketitoi and to an earlier experimental area known as the Puwera Farm.

Attendances of local people were very good and there were large numbers of visitors from as far as Southland. Papers and discussions will be printed in the proceedings of the conference, which are sent on publication to full members of the association. A list of speakers and their subjects appears elsewhere in this article and non-members requiring copies of the proceedings should place orders early with the secretary to the association, c/o Box 2298, Wellington.

Land Development

The Puketitoi Block visited by the conference is part of the 93,000 acres at present under development by the Lands and Survey Department in the 9 northern counties of Northland. Blocks totalling another 228,000 acres have been selected for closer investigation for development. Portion of the 93,000 acres at present being developed is expected to yield 150 dairy farms and 80 sheep farms.

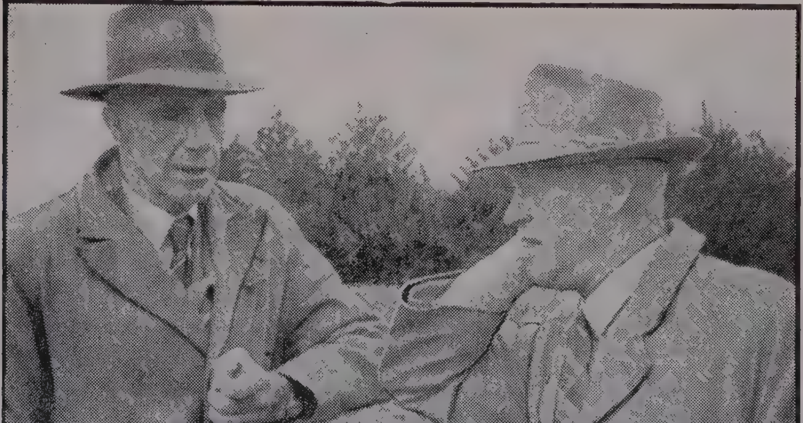
The main soil types under development are volcanic clay, gum clay, ironstone, peat, and consolidated sand.

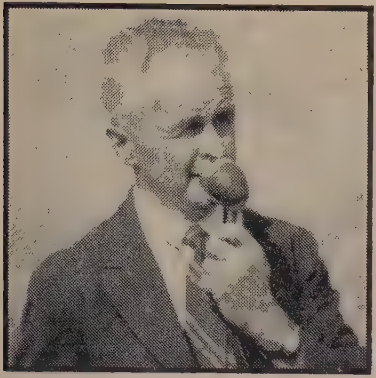
"As a result of the combined efforts of those who carried out experiments in the past no real difficulties are now apparent in developing and establishing pasture on all these types of soil," Mr. Brown said in his review of the Department's development schemes. "Provided the contour is reasonable, by far the largest proportion of the soils of Northland which were termed 'problem' soils in the past can now be developed for farming."

The presence at the conference of all four Instructors in Agriculture at Whangarei since there has been a resident instructor there—Messrs. C. J. Hamblyn (1926-36), E. B. Glanville (1936-41), E. H. Arnold (1941-49), and C. E. Ballinger (1949-—)—lent interest to discussion of grassland development in the district.

Early Search for Pastures

In describing on the Puwera Farm work started there in 1912 with "dozens and dozens of grasses to see what would grow" Mr. P. W. Smallfield, Director of the Extension Division, Department of Agriculture, and


Left—Professor A. W. Hudson, retiring president: More research to protect gullible farmers. Right—Mr. P. W. Smallfield: Tribute to early workers at Puwera, who showed how gumland could be grassed.



Mr. C. E. Ballinger, Instructor in Agriculture, Whangarei: Some "verra puir success" with oversowing of pastures.

previously Fields Superintendent in Auckland, said that it had been shown that "you could go into very poor land and could sow perennial ryegrass and white clover without previous cropping. Previously the general conception was that you had to crop or plough in green manure. It was demonstrated that you can build up fertility on the surface once grass is established. If the original people who did that early work could see this gathering today and could see the large-scale development of gumland that is going on they would feel the work put in here was well worth while."

Mr. Smallfield referred to the appropriateness of the conference's finishing up its viewing of the gumlands with a view of Puwera, the history of which cast an interesting light on the history of grassland farming in Northland.

The mixture generally recommended for gumland pastures today was 20lb. of perennial ryegrass, 3lb. of white clover, 5lb. of Italian or short-rotation ryegrass, and some cocksfoot and timothy. "If you had given that advice 30 years ago no one would have believed it," said Mr. Smallfield. "They believed in cultivation; they used some lime, but they thought phosphate was frills. In North Auckland 30 years ago you would have found some perennial ryegrass at Helensville and Ruawai, but not much. When work started at Puwera to see what could be done with the gumlands perennial ryegrass did not enter into the thoughts of the people doing it. The war intervened in the early work, but in 1920 the Government said we had better get ahead and see if a dairy farm could be developed at Puwera; active land development had to take place.

"There were not many grasses that could be used. The best thing to try for was paspalum. It had low winter production and nothing in the spring. It was questionable whether it was possible to develop the land for dairying.

"It was known that in some parts of New Zealand there were much better strains of ryegrass. W. Dibble secured some from the east coast. After a crop of soft turnips they sowed at Puwera a perennial ryegrass-paspalum-white clover pasture. Everybody thought that by tomorrow the ryegrass would vanish, but it persisted; it was a perennial strain. By the time it was definitely known that it was worth sowing, certification came in to provide reliable strains of perennial ryegrass. This opened up the prospect that you could confidently develop marginal land and use perennial ryegrass in its development. It was found that you could take up virgin gumland, cultivate it properly, sow it in perennial ryegrass and paspalum, and get pastures reasonably good for dairying."

Mr. E. H. Arnold, Assistant Fields Superintendent, Auckland: Can't get rid of kikuyu, so have to use it.

Mr. L. Corkill: "Many mistakes in use of short-rotation ryegrass in the north."

In referring to the two schools of thought about seed-bed preparation—surface cultivation and deep ploughing—Mr. Smallfield said it became obvious that the best seed-bed was secured with ploughing and proper working down. "A bit more cultivation and smoothing and levelling

BELOW: Mr. N. H. Taylor (inset right) discussing gumland soils. In the background is part of the Puketitoi Block, the development of which by the Lands and Survey Department was described by Mr. J. H. Sinclair (inset left).

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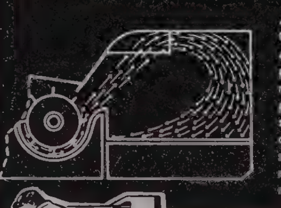

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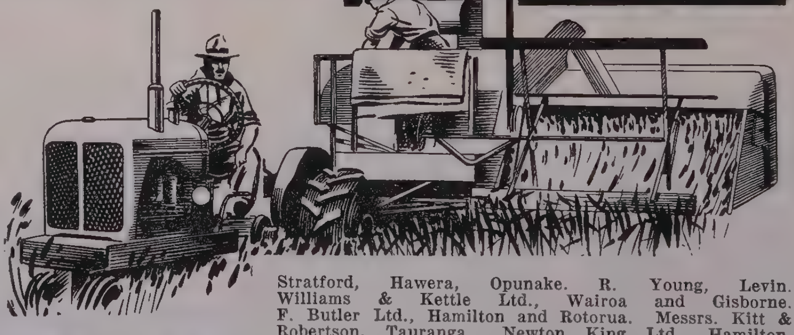

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would be to advantage today in the establishment of pastures on gumland," he added. Puwera had shown how gumland could be grassed and it provided a new conception in marginal land development.

Agricultural Research

Stating that by far the greatest contribution to research comes from Government funds, Professor A. W. Hudson in his presidential address to the conference suggested that the time had come when the primary industries themselves should give serious thought to the contribution they are making and should make to research into problems concerning their own welfare.

"My experience of farmers," he said, "is that they are willing to pay for good service and I am sure that payment of a contribution to research would be no exception to this. . . . Unfortunately this willingness is too often exploited unfairly to the disadvantage of the farmer . . . insufficiently informed in many cases concerning matters of moment to himself and in particular those of a technical nature. It is not surprising therefore that not infrequently he is a victim of his lack of knowledge."

As an example of the consequences of this Professor Hudson then quoted from a Press report the reply by the Minister of Agriculture to a question by Mr. T. P. Shand, M.P., whether the Minister was aware that Vitex Proprietary was selling mixed fertiliser without attaching to the container any certificate of analysis of its contents and whether he could confirm that on a recent analysis the constituents of a mixture selling at about £110 a ton were worth less than £20 a ton.

Professor Hudson said he had quoted the Minister's reply giving ingredient costs ranging from £21 to £36 to illustrate farmers' readiness to pay for something which they think is going to benefit their land and stock. "How much better it would be," he said, "for money to be spent on acquiring information through research which would enable them to know how and what they should use."

Mr. J. E. Bell: "Molybdenum . . . a weapon for increasing fertility."

Hill Country

There appeared to be some disappointment among local farmers that the conference programme offered so little to the man on hill country. In his paper on "Increasing Production from Northland Hill Country" Mr. A. Briscoe Moore, Pipiwai, estimated that 75 per cent. of the sheep and beef cattle in the 9 northern counties were carried on hill country, of which there were 1,127,000 acres amenable to modern techniques of improvement. The prospects of increased production on this area were enhanced by the development of topdressing by aircraft and blowers. Obstacles he quoted were lack of the right kind of phosphate (basic phosphate) pelleted or granulated for aerial spreading and problems in the replacement of aircraft and 4-wheel drive vehicles of the type needed.

His suggestion during subsequent discussion that "superphosphate seems to be to some extent in the discard" drew from Mr. R. B. Tennent, Assistant Director-General of Agriculture, the remark that he "didn't think Mr. Moore was serious". Mr. Tennent told the conference of the plans to bring fertiliser experts from Scotland to advise the Government and said that the prototype of a Californian-built aerial topdressing aeroplane specially designed for New Zealand was due to arrive in January. The prototype of a topdressing plane produced by a British firm would not be ready for 9 months. If officers who had gone to study the Californian machine and its specifications reported that it was suitable for New Zealand conditions, he had no doubt that the Government would see that the planes could be purchased as replacements for Tiger Moths so that aerial topdressing would not be hampered for lack of aircraft.

Molybdenum

Describing molybdenum as a weapon presented to farmers for increasing fertility, Mr. J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland, during the visit to Mr. James's farm told of the responses from trials with molybdenum in the Auckland Province.

On the newer volcanic soils near Whangarei—the younger soils—there was practically no response.

On the more leached soils there was a small response.

On the more mature soils of the volcanic order there was more response.

In one trial on the volcanic hills there had been a very high response.

On the lower greywacke soils there was quite considerable response.

On sandstone the response was slight, but on other sandstone soils further south there were quite considerable responses.

When it was considered that volcanic hills form the bulk of the country in North Auckland the implications were great. The introduction of

Left—Mr. E. Briscoe Moore: "Superphosphate in the discard." Right—Mr. R. B. Tennent: "Aerial topdressing would not be hampered for lack of aircraft."

On the Dargaville Demonstration Farm 19,030lb. of dry matter per acre.

molybdenum might mean a turning point in country at present reverting.

It was generally found that responses were got on soils that respond to lime, North African phosphate, and basic slag, but there were a lot of other gumland soils where lime and basic slag are not used and responses were being secured.

In giving a warning that on soils over-supplied with molybdenum digestive troubles can arise in stock, Mr. Bell said, "A farmer can carry out a test fairly simply by applying some molybdenum on a small strip of pasture. If he sees results, then make a small application—up to 2½oz. per acre. He should not apply any more until he has shown a further response."

A farmer who referred to the wonderful results he was getting—"a mass of subterranean clover"—on sandstone country extremely acid and extremely short of phosphate led to Professor Hudson repeating the warning he gave in his presidential address about "molybdenum being included in some of the concoctions being sold to gullible farmers". "You could get the same results with molybdenum costing about 1s. 6d. per acre. Go and ask your Instructor," he advised.

Manuka Blight

An invitation by the president to raise the contentious question of manuka blight was accepted by Mr. E. A. Madden, Agrostologist, Department of Agriculture, Palmerston North, who said "the insect is doing marvellous work and has already done it in some places. It is well established in some parts of Northland".

He referred to farmers who were wise enough to bring the blight to the district being wary of discussing it with their neighbours and reluctantly confessing to "having some on their places".

"Where the manuka is dying other more useful plants are taking up the running—in many places grasses and clovers and in others trees of a more useful type," he said.

Drainage

Pugging and poaching of pastures and the impossibility frequently of getting on to the land in the north in winter were subjects that arose so often in papers and discussions that it was not surprising when a symposium on drainage provoked keen questioning and discussion.

In a paper on the farm drainage service operated by Massey Agricultural College it was stated: "Many of the problems encountered in southern districts may also be found in abundance in Northland and this justifies the establishment of a small unit. There are problems also peculiar to the locality for which no standard technique is available. . . . The gumlands are, of course, a good example."

Another speaker concluded that there might be a place in Northland for the surface drain on rolling country where the existence of a pan formation close to the surface precluded the use of more orthodox methods.

Freight charges more than doubled the price of tiles made at Plimmerton and sold at Whangarei, Professor Hudson revealed. "It is absurd that tiles should be brought 540 miles when they are being manufactured at New Lynn and could be manufactured in North Auckland," he said. In mentioning that the Kamo works would shortly be turning out tiles in considerable quantities he said, "local demand may be met for a short time by a supply from this source, but I feel sure that with the increased supply of suitable machines for digging tile trenches and a better appreciation of the value of drainage, the inevitable growth in the use of tile drainage will be such that production at some place north of Kamo may be highly desirable."

Pasture Production

A yield of 19,030lb. of dry matter per acre secured in 1952-53 on the Dargaville Demonstration Farm was described in a paper by Mr. P. B. Lynch, Crop Experimentalist, Department of Agriculture, as "the highest yearly production secured to date in Extension Division trials and, as far as I have been able to ascertain, is higher than any yield secured to date in New Zealand". Butterfat production on the farm in the same season was about 160lb. per acre, secured partly from the highly productive Kaipara clay and partly from the low-producing Te Kopuru sand, which occupies about 35 acres of the 125 acres of the farm.

The generally satisfactory production from Northland pastures but the comparatively low returns in butterfat were freely commented on by visitors, who were inclined to see a need for better management and utilisation. The absence of silage stacks was particularly noted by southerners during a post-conference tour.

Several papers dealt with pasture species of value in Northland and there was particular interest in one on strains of strawberry clover, for which seed a merchant said there was a definite demand but supplies of which appeared to be of inferior quality.

Next Conference at Nelson

The association's 1954 conference is to be held in Nelson.

The following executive committee was appointed:—

President, Mr. G. A. Holmes; vice-president, Dr. J. F. Filmer; Professor A. W. Hudson, Messrs. C. C. Leitch and L. Corkill; secretary, Mr. S. H. Saxby.

Post-conference Bus Tour

A most successful innovation this year was a post-conference bus tour of a large part of Northland which included visits to further land development blocks and the Dargaville Demonstration Farm.

Conference Papers

"Soils of Northland", N. H. Taylor and C. F. Sutherland.

"An Introduction to Northland", E. H. Arnold and R. H. Scott.

"Development of Unimproved Scrubland", J. B. Brown.

"Breaking in Scrub Gumland", C. E. Ballinger.

"Increasing Production from Northland Hill Country", A. Briscoe Moore.

Presidential address, Professor A. W. Hudson.

"Some Subtropical and other Grasses in Northland", E. H. Arnold.

"Paspalum and its Place in the Bay of Plenty", A. V. Allo.

"Records of Production from Kikuyu Grass", C. E. Ballinger.

"Possibilities of Drainage by Mechanical Means in Northland", D. F. Scott.

"The Organisation and Function of a Land Drainage Service", D. G. Bowler.

"Surface Drainage", G. L. Banfield.

"Some Suggestions for the Encouragement of Farm Drainage in Northland", A. W. Hudson.

"Caterpillars in Pastures", C. M. Blick.

"Pasture Production at the Dargaville Demonstration Farm", P. B. Lynch.

"Results of Pasture Establishment Trials", P. D. Sears.

"Strains of Strawberry Clover", L. W. Gorman.

"Pasture Measurement Techniques as Applied to Strain Testing", A. J. McNeur.

The printed proceedings (15s. per copy) may be ordered from the Secretary to the Association, Box 2298, Wellington.

Planting for the Winter Supply of Vegetables

THOUGH by December there will be a wide range of vegetables at varying stages of maturity in most gardens, the earlier enthusiasm of gardeners must not abate if a continuity of supplies is to be maintained. For maximum results it is important that the home gardener should realise that vegetable growing is not just a spring and summer job. There are two main planting seasons, spring and early autumn. Successional sowings for the production of most vegetables are made from July to late February. Usually the amateur concentrates on spring planting and often grows more than his family can consume during summer. In winter his garden is usually not as well stocked as it could be. In many districts January will be the latest that any vegetable seeds can be sown, and even the setting out of plants will have to be completed soon if a satisfactory supply of vegetables is to be available in winter. The first part of this article is by H. P. Thomas, formerly Horticultural Instructor, Department of Agriculture, Wanganui; the section on routine work is by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.

PLANNING ahead is the only way to ensure that the family vegetable requirements are met at all seasons. Provision for winter supplies begins with the sowing of seeds from October to December to give plants for setting out from December to April, according to the district and the maturity period of the kinds grown.

The following subjects are those usually grown for winter requirements: Brassicas, including red (or pickling) cabbage, broccoli (winter cauliflower), broccoli (sprouting), brussels sprouts, borecole (curly kale), and savoy cabbage (in northern districts Hendersons Succession cabbage is favoured for winter supplies in place of the savoy); silver beet, spinach beet, winter spinach, leeks, lettuce, celery, and celeriac; and swedes, carrots, and parsnips.

Brassicas

Brassica crops or winter greens are gross feeders and thrive in rich, well-drained, thoroughly cultivated soils. Farmyard manure or any other organic material will improve the soil structure and supply some essential elements for plant growth.

Materials such as compost, leaf-mould, straw or old stack bottom, or lawn clippings are best incorporated into the soil some months before planting, as this allows them to decompose before the onset of cold weather. A dressing of sulphate of ammonia, nitrate of soda, or blood and bone during the turning in of the organic material will help to hasten its decomposition and to offset temporary nitrogen deficiency.

Brassicas require liberal amounts of calcium, and lime applications of 2 to 4oz. per square yard annually are usually beneficial. A good general fertiliser mixture for home gardens is 4 parts of serpentine superphosphate, 3 parts of blood and bone, 1 part of sulphate of ammonia, and 1 part of potash, all by weight, applied at 4oz. to the square yard. This mixture may be broadcast and worked in as a base dressing before planting or as a side dressing at ¼lb. to 4ft. of row.

Planting out

Transplanting of plants (seeds of which should have been sown in late October or November) to permanent positions should preferably be done in cool, cloudy weather or during late afternoon or early morning. A thorough watering of the seed-bed before lifting of plants will assist in the retention of soil on the roots and will prevent drying out and damage to the young roots.

Checks received at transplanting by crops such as cauliflower and broccoli are likely to retard proper development and may result in premature bolting to seed or buttoning of heads.

It is advisable to lift a few plants at a time or to puddle the roots in a bucket containing a thick "soup" of mud and water to prevent the roots from drying out.

The best plants are those 3 to 4in. high with a firm stem and general healthy appearance. Ample spacings must be given when planting out, so that plants may develop properly and maintenance work can be done conveniently. Always watch the growing points of seedlings to see that they are not "blind" or damaged, and examine the roots for swellings of club root disease. Any plants about which the gardener has doubts should be

HEADING PHOTOGRAPH: A good selection of vegetables for winter. Sparrow photo.

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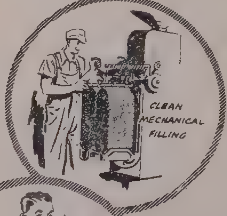
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[Green and Hahn

Strong celery plants which are ready for setting out.

destroyed. Some growers prefer to trim back part of the top leaves to prevent excessive loss of moisture through the leaves until the roots become established. Trimming is not necessary where soil conditions are satisfactory and watering is possible.

Holes made for transplanted seedlings should be sufficiently large to take the roots without their being doubled up. Removal of portion of the taproots should not be necessary if the plants have not been crowded together or left too long in the seedbed. Plants should be inserted so that the lowest leaves remain just above ground level. It is important that the soil around each plant should be firmed so that the roots come in close contact with the soil moisture and no large air pockets are left. Where dibbles are used firm-sided holes are produced and there is always the danger of leaving air pockets.

Watering the soil after transplanting will assist greatly in settling plants in their new positions.

The following table gives recommended varieties of brassica plants which if set out now will mature in the months shown.

	Mature
Broccoli (winter cauliflower):	
American No. 1	June-July
American No. 2	Aug.-Sept.
American No. 3	Sept.-Oct.
Roscoff No. 1	June-July
Roscoff No. 2	July-Aug.
Roscoff No. 3	Aug.-Sept.
Phenomenal Maincrop	June-July
Winter Mammoth	July-Aug.
Snows Winter White	June-Aug
Lily White No. 1	July-Aug.
Lily White No. 2	Aug.-Sept.
St. Valentine	Aug.-Sept.
Broccoli (sprouting):	
Calabrese (green)	June-Sept.
Purple Sprouting	June-Sept.
White Sprouting	June-Sept.
Borecole (kale):	
Dwarf Green	July-Sept.
Tall Green Curled	July-Sept.
Brussels sprouts:	
Fillbasket	June-Sept.
Cabbage (savoy):	
Drumhead	May-July
Omega	July-Sept.

Carrots

Carrots thrive in a deep, rich, well-drained, and well-cultivated soil, preferably one that is light. Carrots are fairly tolerant of acid conditions, but where a deficiency of lime is suspected the soil can be improved by the application of 3 to 4oz. of lime to the square yard. Where the organic content of the soil is satisfactory a complete fertiliser high in phosphoric acid and potash is likely to give satisfactory results. This fertiliser may be made up of 10 parts of superphosphate, 3 parts of sulphate of ammonia, and 1 part of sulphate or muriate of potash, all by weight, and applied at 2 to 3oz. per square yard.

Main-crop plantings naturally vary with districts and may be made from late September to January. However, in southern districts a January sowing will probably be successful only if conditions are very favourable. Prior experience and a knowledge of local climatic conditions must be the gardener's guide in selecting suitable sowing dates.

Carrot seed should be sown as thinly as possible ½in. deep in rows 12 to 15in. apart. Carrots rarely need thinning if sown sparsely, but where necessary they may be thinned to 4 to 6in. apart. Plants removed may be used in soups or stews if they have attained a reasonable size. The short varieties of carrots are usually grown for the very late sowings.

Varieties: Early Short Horn, Early Scarlet Horn, Chantenay, and Nantes.

Leeks

Leeks are very easily grown, are rarely affected by insect pests or diseases, and unlike most vegetables they will stand for many months until required.

Though leeks will tolerate a wide range of soil conditions, they are gross feeders and respond well to liberal manuring and watering. Time spent on adequate preparation of the soil is well repaid in a useful crop available when most other vegetables are fairly scarce. For best results the soil should be enriched with well-decayed farmyard manure or compost plus a fertiliser mixture of equal parts of blood and bone and superphosphate and 10 per cent. of sulphate of potash. The fertiliser should be worked into the bed or trenches at the rate of 1lb. to 20ft. of row. Plants may be set 6 to 8in. apart in holes 5 to 6in. deep.

Plants are usually bought from seedsmen, though they may be raised easily from seed sown from August to October in a box under glass or in prepared ground outside when the ground has warmed up.

Leek plants may be set out from mid-December to the end of February, though December and January are the preferred months. A supply of leeks from mid-winter to spring can be ensured by sowing in late September or early October and about mid-December lifting the plants and sorting them into three sizes; the largest are set out and the other two groups heeled in and planted during January and February respectively.

In light soils it is advisable to make the holes at the base of a trench 3 to 4in. deep drawn out with a hoe. Each plant is dropped into a hole so that its roots rest at the bottom and only the tips of the leaves protrude. If the plants are watered immediately, the roots will seldom need to be covered separately, as the watering washes down sufficient soil to give the young plants a start. Later the holes will be filled by the growth of the plants and by soil washed down by rain.

Leeks may also be set out in well-manured trenches approximately 1ft. deep and 15in. wide, with the plants spaced 6 to 8in. apart. Plants should be cultivated frequently and earthed up as they grow, but care should be taken not to cover the hearts of the young plants with soil.

Varieties: London Flag or Broad Flag (early), Musselburgh (mid-season), and Lyon (late).

Celery

Celery is an exacting crop to grow, but those who are prepared to give it the attention it requires and to water and spray plants regularly will find it a worthwhile crop.

A continuous supply of water is essential for quality produce, though the soil should be well drained. Well-decomposed, bulky organic manures such as fowl or farmyard manure are preferable for celery. It is advisable to supplement them with the three major elements, nitrogen, phosphorus, and potassium, in a ratio of approximately 1 : 2 : 1. Soils not recently limed may benefit from a dressing of 3 to 4oz. of lime per square yard, but as celery prefers a neutral to slightly acid soil, care should be taken not to over-lime.

Most home gardeners prefer to buy their plants for setting out in December and January. In the home garden double or treble rows 12in. apart with 8 to 12in. between plants in the rows are usual for the self-blanching types of celery planted in level beds. Double or single rows may be used with the open trench method. Trenches may be 1ft. deep and 15in. wide for single rows or 2ft. wide for double rows. Trench planting is not as popular as row cropping; the former method is more suitable where irrigation is necessary or for the colder districts.

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Silver Beet and Spinach Beet

Both silver beet and spinach beet are useful, quick-maturing vegetables which grow well even in the cool conditions of early spring and autumn and in some districts throughout most of winter. Spinach beet is hardier than silver beet and can be harvested over a longer period.

Soils for silver beet and spinach beet should be well prepared and well manured. A complete fertiliser similar to that recommended for celery applied at 2 to 4oz. per square yard will give good results on a wide range of soils. The application of 3 to 4oz. of lime per square yard will benefit crops grown on acid soils. Late sowings are usually made where the crops are to stand. Sowings and transplantings may be made during January and February for autumn and early spring harvestings in most districts. In southern districts, however, the situation must be favourable and the soil in good condition so that the seed for later sowings germinates promptly and the plants become firmly established before the onset of winter.

Seed should be sown ½in. deep in rows 15 to 18in. apart and the young plants later thinned or planted out to 9 to 12in. apart.

Varieties: Silver beet: Lucullus, Fordhook Giant, Large Ribbed Dark Green. Spinach beet: Perpetual Green Leaved.

Lettuce

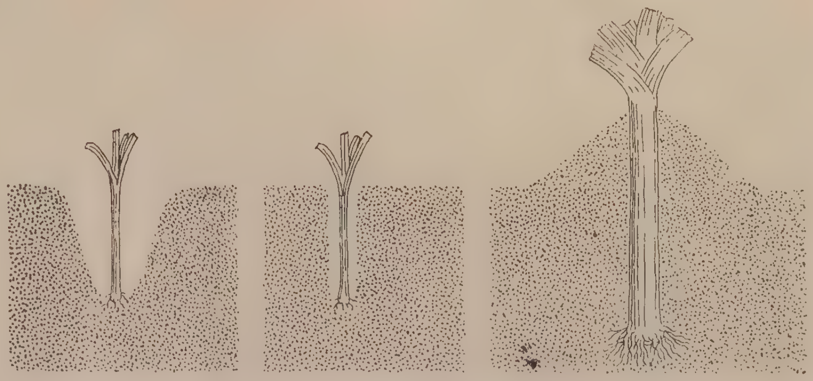
For autumn and early winter supplies of lettuce, seed may be sown ¼in. deep in rows 12 to 15in. apart during December, January, and February. Plants should be thinned to 8 to 12in. apart. Some growers sow seed in beds and transplant, but direct field sowing is recommended, as plants so treated are not checked and therefore mature quicker. With direct sowing seed should be sown sparsely, as little thinning is then needed and disturbance of establishing plants is reduced. For late plantings (February) it may be wiser and more convenient to raise plants in boxes and transplant them to raised beds than to sow seed directly into the garden.

The secret of producing crisp, tender heads is quick growth and for this a soil rich in available plant foods is necessary. Well-rotted stable or farmyard manure or compost should be dug in some time before planting. When hearting is about to begin it is advisable to dress the soil with some quick-acting nitrogenous fertiliser.

Nitrate of soda or sulphate of ammonia supplied in liquid form (1oz. of either to 4 gallons of water) weekly will give this stimulus. Applications of liquid animal manure may be substituted.

Though cos or romaine lettuce is not commonly grown in New Zealand, it is worth a trial. Its flavour is good, it is extremely hardy, and it is most suitable for autumn sowing and a winter crop. The cos lettuce is characterised by its upright growth habit, elongated head, and stiff leaves.

Varieties of lettuce recommended for late sowings are: Imperial 615, Neapolitan (Winter Market), Cos Improved, and Cos White.



Left—Correct method of setting out a young leek plant in a trench. Middle—Leek planted in a dibble hole and watered; watering usually settles sufficient earth around the roots. Right—Earthing up around the plant as it grows will blanch the stem.

Spinach

Spinach (winter or prickly) is a useful vegetable for late autumn sowing, and because it can withstand cool conditions, it can be sown throughout winter in well-drained and well-cultivated soil provided the seedlings withstand the action of frost during their early establishment. A good dressing of organic material such as well-rotted farmyard manure or compost supplemented by a complete fertiliser applied at 1½ to 3oz. a square yard is recommended. As quick growth is necessary to produce tender, succulent leaves, extra applications of nitrogen in the form of a liquid manure will prove beneficial. Light side dressings of nitrate of soda or sulphate of ammonia may be applied and lightly worked in near the plants, but care should be taken to see that it does not touch the foliage, because it may cause burning.

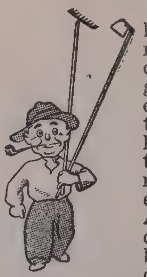
[*Sparrow*

Onion tops bent over to hasten ripening.

Lime should be applied to most soils not recently dressed, though care must be taken not to supply too much. Seed should be sown thinly ½ to 1in. deep in rows 12 to 15in. apart.

Plants can be thinned if necessary to 4 or 5 plants to each 1ft. of row, though if seed is shown thinly, thinning can be confined to the removal of the plants as they become large enough to use.

Work for January



Cultivation with the hoe and other implements should be frequent to check weed growth. Weeds are more easily controlled at this time of year and when hoed up die rapidly in the hot sun and do not require gathering up as earlier in the season. All weeds should be destroyed when young, because if allowed to develop they not only rob the plants of food and moisture and are hosts for disease, but their seed will increase the weed population next season.

Though the garden may be fully planted, it should not be neglected. Asparagus beds should be kept free of weeds and tomatoes pruned and tied to supports. Kumara vines should be lifted periodically to prevent them rooting along the runners, and if this is done regularly, the vines will not mat together and are much more easily lifted. Sweet corn should have the soil drawn up to it as it grows to help support the plants, and plants exposed to strong winds should also be supported with stakes. As the cobs form a watch should be kept for signs of caterpillars which may be attacking the cobs; they are usually found at the silk ends. For control apply D.D.T. as a spray or dust. To be of the best quality, cobs should be picked every 2 or 3 days as they reach

[*Sparrow*

Only home gardeners who grow and harvest sweet corn can know how different is its quality when harvested at the correct stage of maturity from that of corn not freshly picked.

the milk stage. Maturity is indicated by the husk being well filled and tight.

All brassicas (cabbages, cauliflowers, etc.) will need protection from aphides or caterpillars of the white butterfly and diamond-backed moth and should be sprayed with nicotine sulphate or H.E.T.P. sprays to control aphides or dusted frequently with D.D.T. powder to control caterpillars.

Potato crops should be kept earthed up to protect them from the potato tuber moth, which is usually very active during the warmest part of the year. In districts where late blight is experienced it will be necessary to spray at 10- to 14-day intervals with Bordeaux mixture or with one of the certified copper compounds. Mature potato crops should be harvested, because if left in the ground for too long at this time of year, they may become sunburnt or be attacked by the potato tuber moth. If rain follows a period of dry weather, the tubers may start quickly into second growth.

Normally onion crops intended for storing should not be pulled until the top growth has died. However, if the weather is wet and the bulbs are fully formed but the tops are still green, ripening may be speeded up by bending the tops over.

Pumpkins and trailing marrows should have the terminal shoots of their leaders pinched off when they have run about 6 to 8ft., as this promotes lateral growth, on which the fruit is borne.

Shallots, which are usually ready to harvest in January, should be left a little longer if the tops are not withered. They should be kept free of weeds, as these keep the ground moist and retard the ripening of the bulbs.

Runner beans, especially the Scarlet Runner variety, will now be in full production. To keep the plants cropping adequate moisture should be supplied and the beans should be gathered before seed development is far advanced.

During dry weather liquid manure can be applied with advantage to most crops. Liquid manure can be made from animal manure tied in a piece of sacking and suspended in water—about 2lb. of fairly fresh manure to 1 gallon of water will make a suitable mixture. Solutions of nitrate of soda or sulphate of ammonia, 1oz. of either to 4 gallons of water, are also useful liquid manures. If the soil is very dry, it is advisable to water it before applying liquid manure, which should not be splashed on to plant foliage, as it may cause injury to the plants.

Sowings

Every home gardener desires a continuous supply of vegetables, and every chance should be taken to fill vacant areas with kinds of vegetables that will give a supply during late autumn and winter.

Beans: Both climbing and dwarf beans can still be sown in districts north of Manawatu. Suitable varieties are: Climber: Market Wonder and Fardenlosa. Dwarf: The Prince and Masterpiece.

Carrots: For winter use in almost all districts the varieties Chantenay, Manchester Table, Early Krop, and Early Horn may be sown. The last two are quick maturing and therefore especially suitable where the growing season is short.

Swedes: This good winter vegetable can still be sown in districts north of Manawatu. The garden type swede should be selected.

Celery: Seed can still be sown in northern districts for a late crop. Good varieties are Golden Self-blanching and Solid White.

Lettuces: In hot weather lettuces are best sown where they are to grow to maturity. Seedlings should be thinned to 8 to 12in. apart. Suitable varieties to sow now are Great Lakes and Neapolitan (summer market).

Peas: In most districts January is the latest that peas can be sown to mature before winter; a quick-maturing variety, such as William Massey, Little Marvel, or Blue Bantam, should be chosen.

Beetroot: Though beetroot can be sown in northern districts as late as March, it is best in the south, where frosts are earlier and generally heavier, to sow early to allow time for bulb development. A good variety is Detroit Red.

Other crops: Seed of silver beet, radish, spinach, cauliflower, and cabbage may also be sown.

Plantings

Leeks: January is often considered the best time to plant leeks, which do best on a rich soil. A good variety is Musselburgh.

Broccoli can be set out in all districts. Good varieties include Lily White, Late White, and Veitches Self-protecting.

Cauliflowers may be set out in southern districts of the South Island. Recommended varieties are Early London, which matures in 4½ months, and Phenomenal (5 months).

Brussels sprouts can be planted in all districts. A good variety is Fill-basket.

Cabbages: In Northland and Auckland it is recommended that plants of Golden Acre or Hendersons Succession should be set out, and in other districts plants of Savoy Drumhead or Omega.

Tomatoes: In Northland and Auckland a few plants of the staked varieties could still be set out for a late crop. For late planting Moneymaker and Potentate are recommended.

Radio Broadcasts

RADIO broadcasts to farmers are made at the following times:—

1XH Hamilton, Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (Waikato stock review).

1XN Whangarei, Mondays at 8.1 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock review), fortnightly on Tuesdays at 12.33 p.m. (Federated Farmers' session), Tuesdays at 6.55 p.m. (Frankton stock market report), Thursdays at 12.33 p.m., Thursdays at 7.15 p.m. (farm talks alternating with session for Bay of Plenty farmers), fortnightly on Fridays at 12.33 p.m. (pig council talk).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m.

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7 p.m., Wednesdays at 7.10 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Tuesdays at 8 p.m., Thursdays at 8 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. and 7.15 p.m., Tuesdays at 7.5 p.m. (Farm and Country session, including Lorneville stock market report), Thursdays at 12.33 p.m.

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Summer Management of Breeding Sows

THE management of breeding sows after the weaning of the summer litter has an important bearing on litter sizes in the following winter and spring farrowing period. Frequently sows do not get sufficient attention at this time, with the result that litters are disappointing at the time when the maximum number of young pigs are required for efficient conversion of a rapidly rising supply of dairy by-products into meat. In this article A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington, outlines the essential points in management to ensure good litters and plenty of pigs when they are most required.

AS long as pigs are raised mainly on the by-products of the dairy industry in New Zealand one of the main problems of the farmer will be how to ensure an adequate supply of pigs in spring to cope adequately with the flush of skimmed milk or whey.

High-producing sows require careful management to ensure that they breed regularly.

Important Management Factors

It is a difficult problem, and if it is to be successfully solved, action is necessary months ahead of the winter and spring farrowing period. Briefly, the factors in management which lead to the desired end are as follows:—

On farms where skimmed milk is fed to pigs farrowings should be planned for 6 weeks to 2 months ahead of the main calving period of the dairy herd, and on farms where whey is fed, up to 3 months ahead of the main calving.

The sow should be fed properly after she weans her summer litter so that conception is more certain and the maximum number of embryos survive.

Mating should be controlled to ensure maximum fertilisation of the eggs liberated by the sow's ovaries.

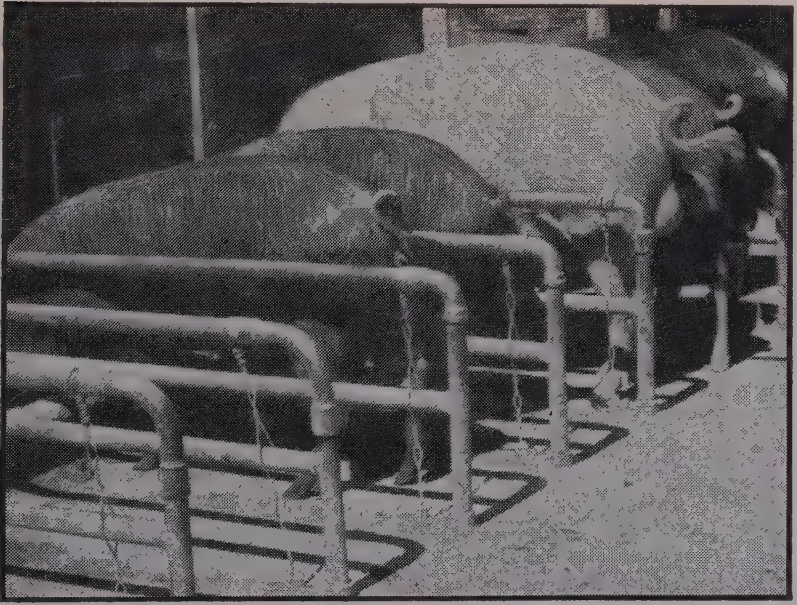
The pregnant sow should have proper care, feeding, and handling.

The farrowing house should permit safe farrowing and control of the sow and litter.

The sow should be accustomed to the house before farrowing.

If possible, personal attention should be provided at farrowing time and extra warmth should be provided for newly born piglets.

Once the critical farrowing period has been successfully passed the pigs should be encouraged to take food independently through the creep to exploit their full growth potential.


Dry-sow feeding bails enable the breeding stock to be individually fed, and sows which have been weaned in low condition can be quickly built up.

Present Incidence of Farrowings

Recent surveys on farms throughout New Zealand have shown that though there is a regular fluctuation in the number of sows farrowing each month over the year, the peaks are reached in July and January and the lowest numbers in April and October. The number of sows farrowing is higher in July than in January, but this is to be expected, as, if a sow is culled after the spring litter, she is usually not replaced until the start of the next breeding season in the following spring.

The advancing of farrowing dates to have the maximum number of sows farrowing in May-June and November-December in the North Island, and the selling mainly of baconers from first litters and of porkers from later litters would have the following results:—

There would be a reduction in the number of large stores needed for carrying over the winter to cope with the flush of milk and in the quantity of farm crops required for maintaining these store pigs.

The period of peak food requirement would coincide better with the peak of milk production.

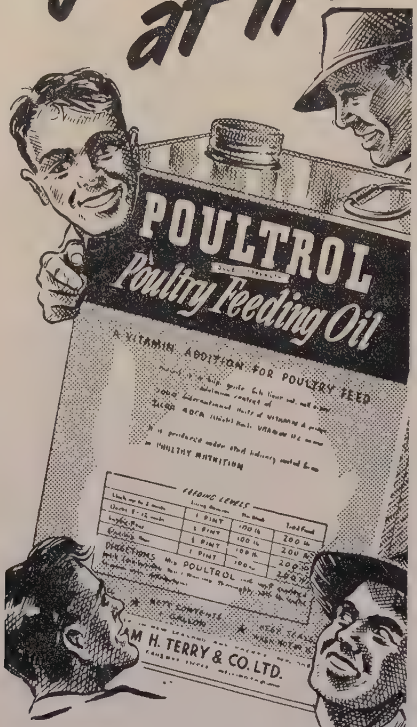
Because the number of pigs was more suitable for the food supply, a higher output of pig meat could be obtained per pound of butterfat and per food unit, including feed from all sources.

Elimination of the store period in a large number of pigs would tend to improve carcass quality.

Right Breeding Cycle

Under natural conditions pigs tend to farrow regularly throughout the year, and it is the planning to make the number of pigs fit the feed supply which is mainly responsible for the fluctuations that have arisen. Once the breeding cycle has been started it is somewhat risky and difficult to try to change the period of farrowing for subsequent litters. Thus, as the peaks are occurring about 6 weeks too late in the North Island, the remedy

Any way you look at it—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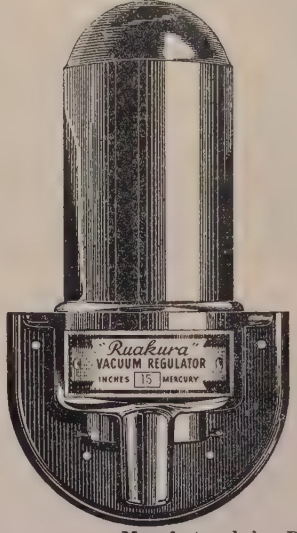
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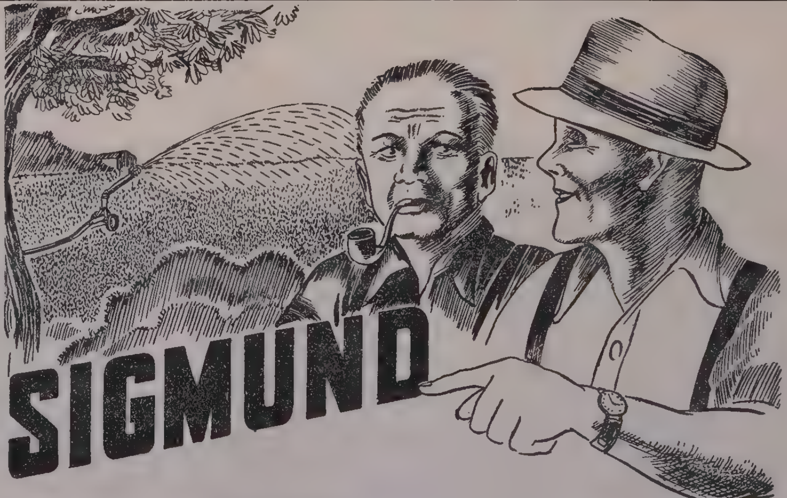

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Once condition has been built up dry sows require little hand feeding if they are allowed good grazing or other greenfeed.

lies very largely in starting gilts off at the right time, that is, mating them in February for May-June farrowing, or in August for November-December farrowing.

If the breeding life of the sow has started and it is desired either to advance or postpone the subsequent litters to comply with the above suggestions, it is better to try to advance the schedule by early weaning of litters, at, say, 5 or 6 weeks or even earlier, if special care has been taken to start the pigs feeding independently.

Plans regarding the date of farrowing the winter litter may be influenced by the desire to get away from the farm for a holiday in May or June and, therefore, to avoid farrowing at this time. However, the getting of more May-June farrowings is so important that special arrangements would be warranted for looking after farrowing sows during holidays. It is certain that there is some climatic advantage for the early litters compared with those farrowed in July and August.

Correct Feeding

Even if mating occurs at the right time to secure earlier farrowings, failures may frequently result because sows do not hold to service.

It is frequently taken for granted that when the summer litter is weaned, say in January or February, the sow can be turned out with the breeding herd and conceive to the first service successfully.

At this time, when milk supplies are beginning to fall, there are often fattening pigs which will take all the milk available. The newly weaned sow is too frequently turned out with the other breeding stock and allowed to fend for herself on grass alone. If she is hand fed, it is usually at a common trough with other heavier sows and the boar, all of which will compete with her for feed. Generally the newly weaned sow does not get the chance she should have at this time of rapid recovery of condition lost during the suckling period. It should be realised that if the sow does not recover quickly after weaning the condition lost in suckling her litter, there is considerable risk of losing time by her failure to conceive to the first service.

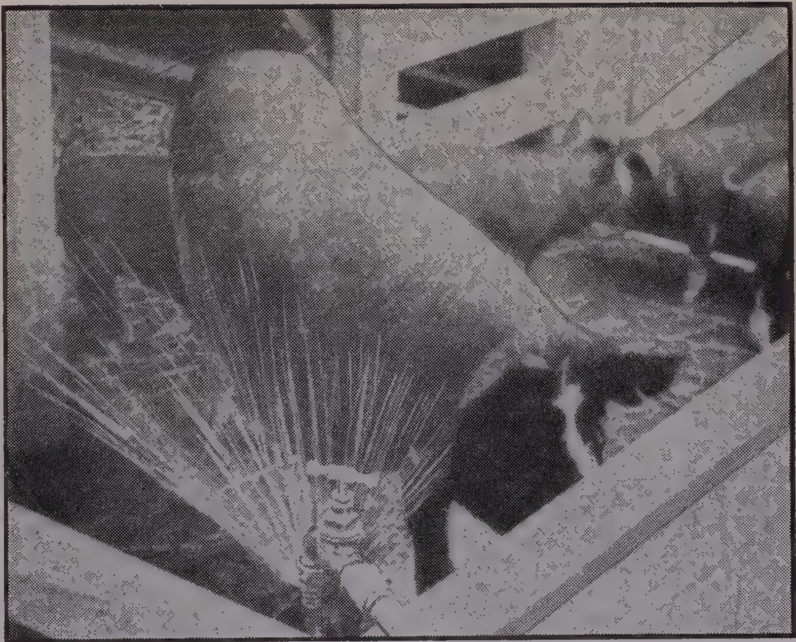
If feed to the baconers is restricted or if some of the fat pigs are disposed of, food can be made available for breeding stock requiring it. The newly weaned sow should get 6 gallons of milk per day and be allowed free grazing. If she is running with other sows or the boar, it is necessary to see that she gets this amount of food. The use of dry-sow feeding bails, as shown in the lower illustration on page 523, with a partitioned trough enables each sow to be fed according to her needs.

Time of Mating

It is desirable to have a separate boar paddock and to turn the sow in with the boar 24 to 36 hours after the beginning of the heat period. A second service as late as possible in the heat period should also be allowed. In this way the maximum number of eggs liberated from the ovaries during heat will be fertilised.

After-service Management

Although it is true that any failure in management up to this stage could have spoilt the chances of a good litter, it is also true that neglect from this stage can result in poor litters. Under good conditions 20 or more eggs



During the heat of the day cooling by evaporation of water sprayed on the concrete yard is very effective.

are liberated at a heat period, but even though all may be fertilised, only a proportion of the embryos develop fully. The reasons for the development of some embryos being arrested are not all known. Some losses are probably due to inherited lethal factors, but anything which causes a check or shock to the pregnant sow can have a detrimental effect. Gross mismanagement such as sudden changes in amount or type of feed can, and sometimes does, cause abortion of the whole litter. Less violent changes, shocks, or rough handling may well result in the arrested development of individual embryos.

A month after service the sow should have recovered sufficient condition, say 40 to 50lb. above her weight at the time of weaning her previous litter, and 2 gallons per day of milk or 2lb. of meal will suffice provided there is good grazing or other greenfeed. The supply of greenfeed needs proper consideration at this time of the year, as unless special provision has been made greenfeed may well be lacking.

Exercise and Greenfeed

As pregnancy progresses it becomes more important to provide exercise and bulk in the ration to keep the bowels active. Though some sows are much more prone to constipation than others, generally the risks associated with this condition increase as pregnancy progresses and the sow tends to avoid exercise.

To provide against the risk of a very dry summer some succulent, bulky feed should be available. If grass silage or green maize is being used for the dairy herd, this can be used with advantage for sows, and special crops such as rape, silver beet, or fodder beet tops should be provided in other cases. Lawn grass clippings should not be wasted. They will be appreciated by sows or pigs being fattened in sties.

Drinking Water

Though recorded observations of the water consumption of dry sows on meal feeding indicate that less than 1 gallon per day is consumed, and even though they may be getting 2 gallons per head of skimmed milk, it is desirable that the sows should have access to clean drinking water. Free choice should be the principle. It will be found that though some sows will not take extra water, others may take appreciable quantities. Drinking bowls or water troughs in which the level is controlled by ballcocks and in which the animals can get only their noses are essential. They should be so designed that the pigs cannot get in and wallow, spilling the water over the sides and making unsightly and dirty holes around the troughs.

Housing

Though pig housing must be draught-proof to provide warmth in winter, it must also provide comfortably cool quarters during the heat of summer. If the house becomes unbearably hot and stuffy, the pigs will seek out a shady spot under a hedge. They are apt to stay out under the hedge at night after a hot day and to be affected by chilling. No place is more risky than a draughty hedge bottom.

Means of keeping the house cool are briefly:—

Insulation of the roof by sarking or, more effectively, the use of some insulating lining under the rafters.

Ventilation: For a house accommodating 5 or 6 dry sows this should be provided in addition to the insulated roof by a controllable opening 4in. x 24in. high in the back of the house and baffled to deflect the incoming air upward. It is good if the front of the house is of the type that can be opened in hot weather.

Evaporation of water: As a pig does not sweat, ventilation alone is not effective in removing body heat when the air temperature is over 75 degrees F. If the house has a concrete yard attached, a spray of water allowed to play on the yard during the heat of the day will effectively control air temperature. Most sow houses, however, are placed out in a paddock without a concrete yard. In districts where a well-ventilated house with an insulated roof is inadequate for avoiding distress to the sows, consideration should be given to the use of water as a cooling agent. This would involve bringing the dry-sow house into the main layout with a concrete yard draining to the main piggery drain or by providing a properly constructed concrete wallow.

During the most critical stage—2 or 3 weeks before farrowing—the sow should be brought into a farrowing unit in which temperature can be effectively controlled. Though the paramount need for sows farrowing during summer is the avoidance of distress due to excessive heat, the reverse is usually the case for winter litters. For these the house must be warm and draught-proof and provided with a brooder lamp which will maintain a temperature of 75 degrees F. over an area of floor specially protected to provide a safe, warm spot for the piglets to lie.

Farrowing Management

The sow should have received a little extra protein-rich food, depending on her condition, during the last month of pregnancy, but for 24 hours before farrowing she should have nothing but water. Many piglets are lost at farrowing when, after inadequate feeding at an early stage, efforts are made to prepare the sow for her lactation by heavy feeding late in the pregnancy period.

If the brooder lamp has been put into operation before the sow farrows, the question of whether she should be attended at farrowing may depend on her temperament. Generally certain losses can be avoided if some one is in attendance, and therefore this is preferable. The piglets should be placed under the heat lamp as soon as they are farrowed, as otherwise the drying of their skin rapidly reduces their body heat.

When farrowing is completed and the sow is comfortable she will let down her milk and the piglets will suckle vigorously. Having been introduced to the warmth of the brooder lamp they will return to it when they feel the need of extra warmth.

Methods to Increase Production

With the increase in sow numbers recorded in recent years there has, unfortunately, been a tendency for the number of pigs reared per sow to fall off. This tendency must be reversed and full use made of every sow by increasing the number reared per litter from the present level of 7 piglets to something like 9 or 10. This is possible if proper care as described in this article is given, coupled with the selection of prolific strains of breeding pigs.

When satisfactory standards in the number of pigs born alive have been achieved steps can be taken by early creep feeding to exploit fully the growth potential of the piglets and obtain the maximum efficiency of feed conversion. Maximum production per sow, however, demands careful planning and management over a long period.

Proceedings of Ruakura Farmers' Conference

THE latest findings in agricultural research are presented in clear and concise form in the "Proceedings of the Ruakura Farmers' Conference Week, 1953", published by the New Zealand Department of Agriculture. The volume, which is of over 200 pages, is a complete record of the papers and discussions on them at the conference. Dr. C. P. McMeekan, Superintendent, Department of Agriculture's Ruakura Animal Research Station, directed the proceedings, in which the Waikato Farmers' Educational Committee co-operated.

Practically all modern farming problems are dealt with frankly and realistically and in language as free as possible from scientific terminology. Sound suggestions and recommendations are given which if put into practice by farmers cannot but improve their farming standards.

"Proceedings of the Ruakura Farmers' Conference Week, 1953" is available at 10s. a copy from the Ruakura Animal Research Station or from Publications Section, Department of Agriculture, P.O. Box 2298, Wellington.

Chemical Control of Twitch

GOOD control of twitch is obtained by the use of T.C.A. (the sodium salt of trichloroacetic acid). This chemical is a selective grass-weed killer and apart from its caustic action on foliage has little effect on broad-leafed plants. T.C.A. is most effectively used in conjunction with cultivation. In practice excellent control has been obtained by ploughing, applying the T.C.A. to the upturned sod, cultivating after 4 to 6 weeks, and then sowing the area to a crop or by preparing the seed-bed and applying the T.C.A. before the crop has emerged. In this latter case crops resistant to T.C.A. should be sown. These crops include all non-grass crops such as brassicas, potatoes, etc.; optimum results are obtained if rainfall follows the T.C.A. application and the soil is moist at the time of treatment. In conjunction with cultivation 30 to 40lb. per acre of T.C.A. is sufficient for control. Without prior cultivation rates of 40 to 60lb. per acre are required. In all cases follow-up treatments should be given, for not all twitch roots are killed by the one application and surviving roots, if not checked, quickly re-establish.

—*L. J. MATTHEWS,*
Weeds Research Officer,
Department of Agriculture,
Wellington

Management of Bee Colonies during the Honey Flow

Seasonal Notes for the Domestic Beekeeper

THE beekeeper's most important consideration during the honey flow is securing the largest crop of honey that the season will allow. A certain amount of skill is required during the honey flow and work to be done is discussed in this article by T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton.

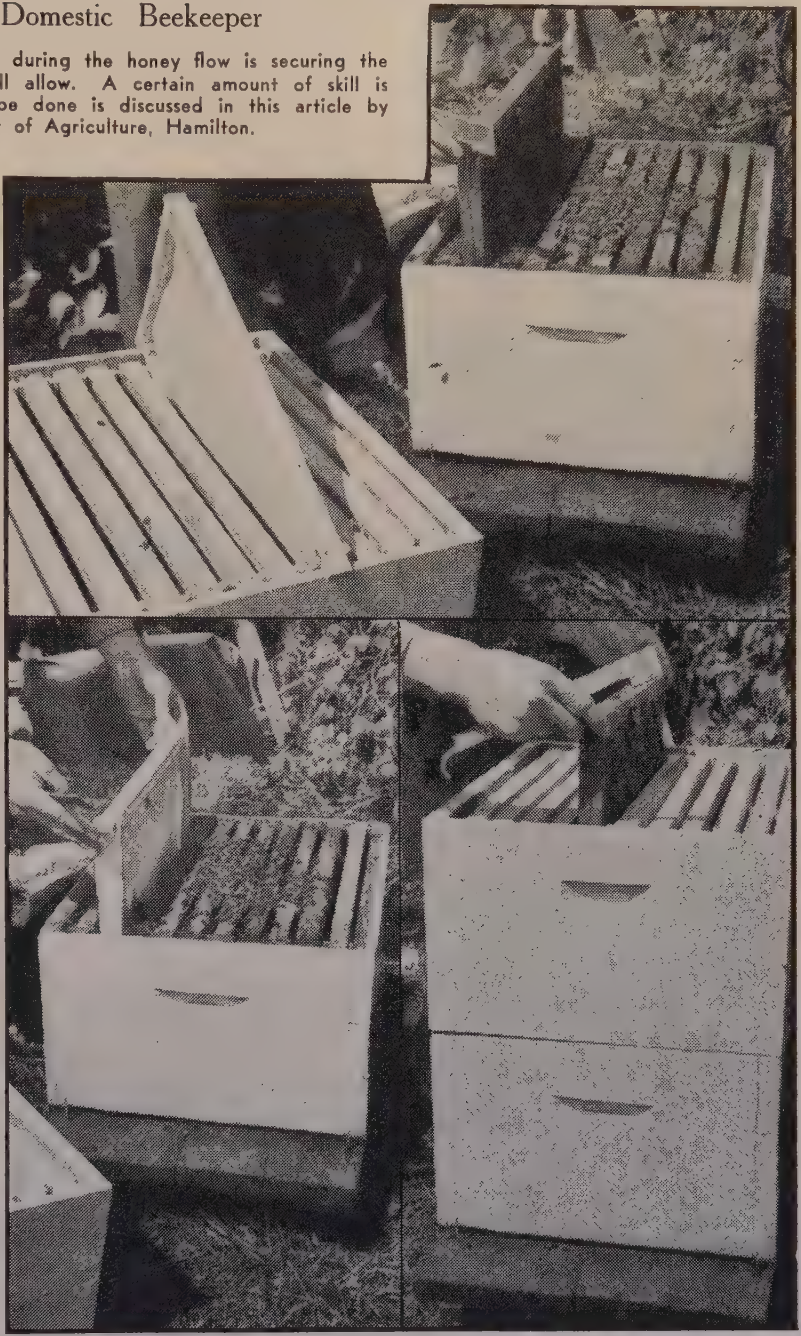
THERE are various flows of nectar during spring, but owing to the unfavourable weather and poor strength of the colony what nectar is gathered is consumed by the hive. With the hot sunny days of summer nectar is again available and with the greater strength of the colony the bees are able to produce honey far in excess of what they require. This period is called the honey flow. Owing to the difference in latitude between the north and south of New Zealand a considerable variation occurs in the time of the honey flow. In some districts it is a short heavy flow, and in others it is a long medium flow.

If the beekeeper has kept bees over a few years, he will know at about what time the main flow will begin. The beginner should record the peculiar conditions of his district so that he is able to time apiary manipulations and have the colony at maximum strength just as the main flow begins. If colonies have received proper attention during spring, have not swarmed, and are headed by young, prolific queens, they should be able to take full advantage of the honey flow. Where a colony is found to be weak it should be united to another colony.

Importance of Ample Room

When the flow begins a careful watch must be kept to see that hives are provided with plenty of room. The bee brings the nectar from the field, gives it to a younger bee, who places it in that part of the hive where the process of conversion into honey will begin. Newly gathered nectar generally contains so much water that if it were immediately stored it would soon ferment. The bees therefore remove the excess moisture, largely through a well-organised and efficient system of fanning. In the midst of a good harvest a hive may lose one-fourth as much in weight during the night as it gained the previous day. It is evident therefore that there must be plenty of empty cells for the temporary storage of incoming nectar. If there are not sufficient empty cells, the bees will place nectar in the brood nest and so interfere with brood rearing. Once the hive becomes blocked with honey the bees will loaf and at this stage it is too late to remedy matters.

The beekeeper should have plenty of drawn combs available, giving a super of them to the colony soon enough so that there will always be some empty comb in the hive. A colony of normal strength therefore should have two supers in which to breed and one super of empty combs at the beginning of the flow. Extra supers of combs are added as the increase in surplus honey indicates. The frames may be spaced farther apart than in the brood nest, giving eight frames, this making uncapping easier.

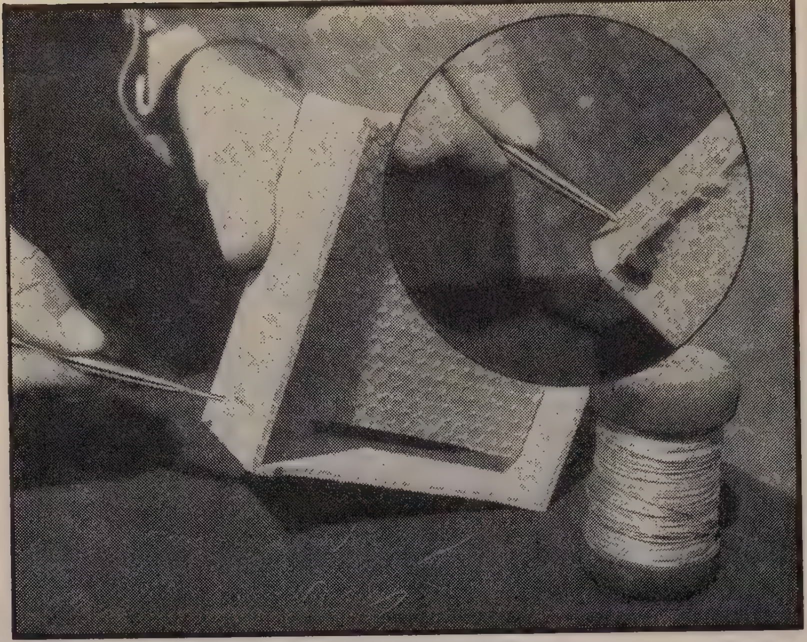


Upper—Removing drawn comb from the brood nest. Lower left—Replacing drawn comb with frame of foundation wax. Lower right—Drawn comb is placed in among the frames of foundation. It acts as a bait and induces the bees to come up and work the frames of foundation wax.

The first super given to the bees should, if possible, contain drawn-out combs. If foundation wax only is available, one or two drawn combs should be taken from next to the brood nest and placed in the middle of the super of foundation. This serves as a bait and induces the bees to come up and work in the super. The positions occupied formerly by these drawn combs may be replaced by frames of foundation wax.

Queen Excluders

Queen excluders should not be used for general purpose until the bees are used to working in the honey super



A piece of U-shaped wire is pushed with tweezers through holes in the side of the section to hold the foundation wax in place. Inset—Removing wire with tweezers after section has been filled by the bees.

and the honey flow is in full swing. Excluders prevent the queen from laying in the combs of the honey-storage super; also the bees will store very little pollen above an excluder and the crop may be removed without the destruction of any brood.

Section Honey

The simplest method of making up sections is to take the required number and place them on edge over a sink or basin. Then pour a stream of hot water from the kettle so that the water runs down each of the grooves. This allows the sections to be folded without breaking them. Then proceed to bend each one with the groove inside. Each section has a saw cut at one end which is cut on a bevel so that when joined one edge overlaps the other. This is to secure the foundation wax when it is inserted.

A special thin comb foundation is manufactured for use in section boxes. This wax should be cut to not quite the size of the section so that it has room for expansion, as the weight and warmth of the bees will cause it to stretch.

This piece of wax will sometimes become warped and will not hang straight in the section. The bees then build the section unevenly. To overcome this trouble the following method should be used: Cut up a few pieces of frame wire about 1in. long and bend them to a U shape. Next, bore two holes about ⅛in. apart, on each side of the section and about an inch up from the bottom. Using a pair of tweezers, push the U-shaped piece of wire through the holes so that a piece of wire goes on each side of the foundation wax. Do the same on the other side and the wax is then held perfectly straight in the section box.

Ventilation

Extra ventilation should be provided where it is noticed that there are a number of bees clustering outside the hive entrance. This may be given by wedging up the front of the hive an inch or two by placing blocks between the bottom board and super.

EDITOR: P. MACKINTOSH

THE JOURNAL OF THE BRITISH GRASSLAND SOCIETY

This Journal is a medium for the publication of the results of research and practical experience in the realm of Grassland Husbandry.

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4. The Chemical Composition and Nutritive Value of Welsh Hay: Comparison with other British Hays. Part II. — W. M. Ashton and D. E. Morgan

The Yields and Composition of Lucerne, Grass and Clover Under Different Systems of Management—I. — R. O. Davies, T. B. Morgan and W. Ellis Davies

6. The Effect of Rabbit Grazing on a Reseeded Pasture. — Winifred M. Phillips

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The Secretary, British Grassland Society, 69 May Street, Belfast, Northern Ireland.

Show Dates

THE following are dates and venues of A. and P. shows up to the end of February:—

NORTH ISLAND

January

1 January—Nuhaka A. and P. at Nuhaka.
4 and 5 January—Rotorua A. and P. at Rotorua.
*15 and 16 January—Wairoa County A. and P. at Wairoa.
16 January—Marton District A. and P. at Marton.
23 January—Central Hawkes Bay A. and P. at Waipukurau.
26 and 27 January—Feilding I., A., and P. at Feilding.
28 and 29 January—Hawkes Bay Ram Fair at Hastings.
29 and 30 January—Horowhenua A. and P. at Levin.
*30 January—North Kaipara Agricultural Association at Paparoa.
30 January—Galatea A. and P. at Galatea.

February

5 and 6 February—Rodney Agricultural Society at Warkworth.
6 February—Clevedon A. and P. at Clevedon.
6 February—Woodville A. and P. at Woodville.
6 February—Rangitikei A. and P. at Taihape.
6 February—Katikati A. and P. at Katikati.
9 and 10 February—Dannevirke District A. and P. at Dannevirke.
12 February—Dannevirke Ram Fair at Dannevirke.
12 and 13 February—Taumarunui and District A. and P. at Taumarunui.
12 and 13 February—Taranaki Agricultural Society at New Plymouth.
13 February—Hukerenui A. and P. at Hukerenui.
*13 February—Waitemata A. and P. at Waiwera North.
13 February—Pahiatua A. and P. at Pahiatua.
13 February—Tauranga A. and P. at Tauranga.
17 February—Te Awamutu A., P., and H. at Te Awamutu.
19 and 20 February—Masterton A. and P. at Masterton.
19 and 20 February—Franklin A. and P. at Pukekohe.
*20 February—Northern Wairoa A. and P. at Arapohue.
20 February—Whangaroa A. and P. at Kaeo.
20 February—Waiapu P. and I. at Ruatoria.
20 February—Te Puke A. and P. at Te Puke.
23 February—Otorohanga A. and P. at Otorohanga.
25 February—Matamata A. and P. at Matamata.
26 and 27 February—Te Kuiti and District A. and P. at Te Kuiti.
26 and 27 February—Wellington and Hutt Valley A. and P. at Upper Hutt.
27 February—Putaruru District A. and P. at Putaruru.
27 February—Whakatane and Rangitaiki A. and P. at Whakatane.
*27 February—Waimarino A., P., H., and I. at Raetihi.

SOUTH ISLAND

January

9 January—Blueskin A. and P. at Waitati.
16 January—Waikouaiti A. and P. at Waikouaiti.
23 January—Palmerston and Waihemo County A. and P. at Palmerston.
*27, 28, and 29 January—Southland A. and P. (Royal show) at Invercargill.

February

*6 February—Golden Bay Agricultural Association at Takaka.
20 February—Banks Peninsula A. and P. at Little River.
20 February—Murchison A. and P. at Murchison.
20 February—Waiau A. and P. at Tuatapere.
26 and 27 February—Buller A. and P. at Westport.
27 February—Maniototo A. and P. at Ranfurly.

* The Department of Agriculture exhibit will be staged at this show.

Management of the Fat Lamb Flock

THE structure of the fat lamb industry and the management of a fat lamb flock were the subjects of an address at this year's Ruakura Farmers' Conference by L. R. Wallace, Chief Nutrition Officer, Department of Agriculture's Ruakura Animal Research Station. Because world population was increasing more rapidly than ever before and food for this ever-growing population could come only from increased production in lands already occupied, the speaker argued that the time was opportune for a thorough stock-taking of the major industries in New Zealand with a view to a decision on objectives and the basic principles on which their achievement should be sought. The speaker considered that in the fat lamb industry the major objective should be to grow as much feed as possible and to use it as efficiently as possible for the production of the maximum amount of wool and fat lamb. His recommendations for attaining this objective are numbered in the following adaptation of his address.

THE fat lamb system is not and never can be a really efficient method of converting grass to animal fats and proteins suitable for human consumption. The breeding ewe, in producing milk, merely provides the raw materials which the lamb has still to convert to meat, and very high losses are involved in this double conversion of feed. Against the small amount of product represented by the wool and by the edible parts of the lamb must be charged not only the grass eaten by the lamb itself, but also that eaten by the ewe during the whole season.

Methods of Increasing Production

It is clear that the only way in which the over-all efficiency of the conversion process can be improved is by increasing the amount of fat lamb produced relative to the total amount of grass consumed to produce it. Four possible methods of achieving this are available.

1. Two Crops of Lambs a Year

It is obvious that the heavy overhead feed cost of ewe maintenance could be cut by making flocks bear two crops of lambs per year instead of only one as at present. Technically it is now possible to do this, but the practice would not provide a workable solution, for rearing two crops of lambs a year would be very difficult because of the seasonal nature of grass production.

2. High Lambing Percentage

The aim could be to concentrate on obtaining a high lambing percentage. In this way the amount of feed eaten by each 100 ewes in a year might be spread over a substantially increased number of lambs and the total amount eaten per lamb reared much reduced. This would be an entirely sound approach.

In Britain the only breeds which have survived in any numbers on the better-class lands are those breeds and crosses with a high lambing percentage. New Zealand Romney breeders have done much to improve the fleece and carcass of the Romney, but little to improve its fertility, in which the breed very poorly meets the requirements of the fat lamb producer. As long as Romneys are bred in the hills, cast-for-age Romney ewes will be found on the fat lamb farms, but it is to be hoped that the low-fertility status of the breed is a cross that fat lamb producers will not always have to bear.

3. Production of Heavier Lambs

The third obvious method of improving the efficiency of feed conversion is by carrying lambs to heavier weights, which means putting a stop to the mass killings of young lambs which occurs each year in the fat lamb industry. This method offers tremendous scope for increased production. Three lines of approach are involved. First, rams of the heavier Down breeds could be used as fat lamb sires. Ewes of the larger breeds are not wanted, because more feed is required to maintain a heavy animal for a year than to maintain a light one, and overhead costs for ewe maintenance must be kept to a minimum; but the use of rams of the heavier breeds would ensure that the lambs were born with the ability to grow large and heavy without becoming overfat, so that they could be held longer, and after weaning could be used to convert a lot of grass directly into meat. Though the suggestion to use the heavier Down breeds may revive criticism, the subject must be considered by anyone honestly interested in obtaining the maximum amount of fat lamb from a given quantity of feed.

Secondly, when lambs are being carried to heavier weights an early weaning policy could be adopted. Producers could do what is being done in the dairy industry—wean early—and thereby reduce to a minimum that period of inefficient double conversion through the ewe during which grass is converted first into milk and the milk then converted into meat by the lamb. Early weaning means weaning at the time when the first draft is sent away, usually early in December. Producers need not be afraid to wean at that time. There is now a great deal of experimental evidence to show that

HEADING PHOTOGRAPH: It is now known that a properly conducted flushing programme will lead to a substantial increase in the proportion of twins born.

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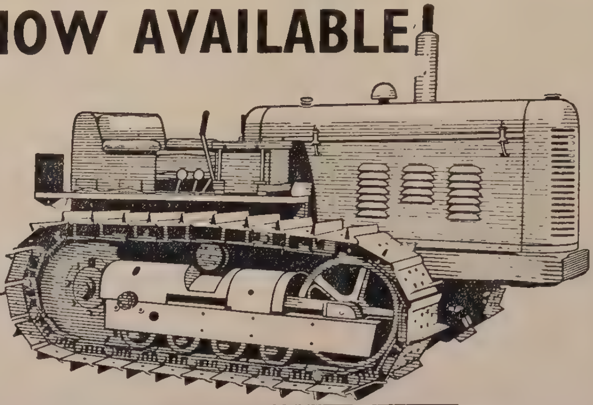

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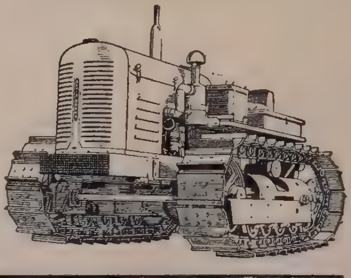
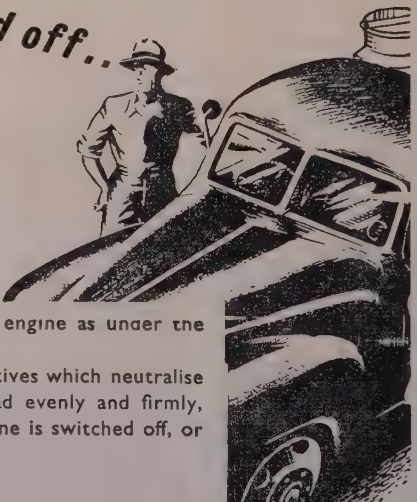


But I've switched off..



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by that time of the year a very minor fraction of the lambs' total feed intake is milk; by far the greater part of it comes from pasture. Early weaning is already being practised successfully by many sound, practical farmers.

Thirdly, in adopting early weaning farmers who are raising heavyweight lambs should take advantage of the improved strains of grasses and clovers now available as a result of the work of the Grasslands Division, Department of Scientific and Industrial Research. With the new strains of short-rotation ryegrass and of red and white clovers it is possible to carry forward from November and December into January, February, and March large quantities of highly palatable and nutritious fattening feeds. Under the method suggested this will have to be done. It is time an effort was made to get rid of much of the rubbish that was sown down 10, 20, and 30 years ago and replace it with the vastly superior products available today. Some producers may feel that workers at the Grasslands Division have not always been unduly modest in their claims about the performance of their newer pasture plants. On the contrary, insufficient emphasis has been placed on the very special value of their red and white clovers to fat lamb producers, for, properly managed, these will provide a tremendous bulk of feed from January to April of a type with lamb-fattening qualities that will startle producers familiar with the fattening qualities of old-type pastures only.

During such pasture replacement serious consideration should be given to a certain amount of cropping for either wintering ewes and cattle or the finishing of lambs. A good crop of swedes should gross close on £50 to £100 per acre, if it is used for the wintering of cattle. Such a crop would also have value in the North Island for flushing ewes in a season favourable to facial eczema.

4. Increasing Carrying Capacity

Of the utmost importance is the need to aim for high carrying capacity to ensure that all the feed grown is actually utilised and to cut down the general farming overhead costs per ewe. High carrying capacity and high average fleece and lamb weights do not as a rule go hand in hand, but it is better to sacrifice average fleece weights and to some extent wool quality and lamb weights to obtain the over-riding advantages of high carrying capacity and high output of wool and fat lamb per acre. The fat lamb farmer who achieves high average fleece weights is not necessarily an efficient farmer—he may simply be carrying many fewer stock and making much less money than he well could do.

So much for the general principles involved. How can these principles be applied to the practical management of an all-grass fat lamb farm? Though much experimental work remains to be done, there are several recommendations which are soundly based on research and practice.

Flock Management at Tupping

It is important to realise that it is the number of eggs shed by the ewe at the time of mating which sets the limit on the number of lambs which she can have. If only one egg is shed, only one lamb can be produced. If two or more eggs are shed, two or more lambs may be produced. If a good lambing percentage is to be obtained, the ewes must be encouraged to shed as many eggs as possible.

This can most easily be done by a properly conducted flushing programme. Flushing, which is the practice of putting ewes on to a much improved diet shortly before and during the time the rams are out, has been the subject of investigation at Ruakura over the last 4 years, and its possibilities are now known. It will not bring ewes on heat any earlier, it will not reduce the number of dry ewes, and it will not result in a more concentrated lambing. It will, however, lead to a substantial increase in the proportion of twins born. If 5-year-old ewes are properly flushed, about half of them should produce either twins or triplets, and with a normal incidence of dry ewes and a normal lamb mortality about 125 lambs should be docked from each 100 ewes put to the ram.

There are three essential features to a properly conducted flushing programme.

1. The ewes should be in vigorous store condition at the time flushing is begun, because ewes in such condition respond best to an improved level of nutrition.
2. A flushing period of 2 to 3 weeks should be provided before the ewes are mated by the ram. A period of good feeding of this length is required to induce the ewes to shed the maximum number of eggs.
3. Flushing should be continued for about a month after the ewes begin to take the ram. This is recommended because the interval between heat periods in the ewe is about 16 days, and a month is sufficiently long to allow each ewe to be tupped twice in the period during which the high level of nutrition is provided. It is important to allow this second chance, because normally only about 80 per cent. of the ewes that get in lamb do so at their first heat period, and because there are always a number of ewes that do not come on heat during the first round.

Therefore, if a farmer knows from experience that substantial numbers of ewes will start taking the ram about the end of February, he should make every endeavour to start flushing them

A good crop of swedes. During pasture replacement serious consideration should be given to a certain amount of cropping for either wintering ewes and cattle or the finishing of lambs.

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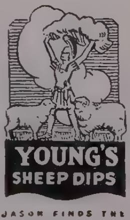

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[*Fraser Niederer*

The number of eggs shed by the ewe sets the limit on the number of lambs which she can have. If a good lambing percentage is to be obtained, the ewes must be encouraged to shed as many eggs as possible, and this can most easily be done by a properly conducted flushing programme.

3 weeks before this and should continue to flush them until the end of March.

An experiment conducted at Ruakura last year illustrates the importance of starting flushing early. Three hundred 5-year-old ewes from the Gisborne area were run together under hard grazing conditions until 14 February, when they were divided into four groups, each of 75 ewes. Flushing of the first group was started immediately and that of the other three groups at weekly intervals thereafter, which meant that by 7 March, when all the ewes were again running together and when the rams were put out, the first group had been flushed for 3 weeks, the second for 2 weeks, the third for 1 week, and the last group had had no flushing treatment. The results are shown in the following table.

	Flushing period before tupping (weeks)			
	3	2	1	0
Lambs born per 100 ewes lambing	153	137	131	121
Lambing percentage (lambs alive at 1 month as percentage of ewes put to the ram)	131	121	112	111

The differences between the groups are quite substantial, and the point requiring emphasis is that the sole difference in management between the group which gave a final lambing percentage of 131 and that which gave the final figure of 111 was in the way in which the ewes were treated over the 3 weeks before the rams were introduced. They were treated exactly alike until 14 February and after 7 March.

Lambing time is a very busy time on most fat lamb properties and often strenuous attempts are made to save lambs to get a good lambing percentage. Though this effort is most praiseworthy, very much greater returns might result from the much smaller effort of organising a properly planned flushing programme in February and March. Farmers and research workers have been much interested in the high lambing percentage figures frequently reported from Southland. From work carried out at Ruakura it is now clear that the main reason for the lower lambing percentages in northern districts is the small number of eggs shed by the ewes at tupping time.

Though it is considered that it is the number of eggs shed by the ewes which mainly decides the lambing percentage, the efficiency of the ram is also important. Different farmers follow different procedures in putting their rams out. Some put them all out together and leave them out for the whole season. Others prefer to put a few out for a start, saving some to finish off with, in the hope that these will seek out ewes not covered earlier in the season. As yet no experiment has been made at Ruakura to test the various methods. However, a lot of information has been accumulated about the way ewes come on heat and are tupped by the rams, and recommendations are now possible.

By the end of the fourth week of tupping most of the ewes are already in lamb and there is little point in keeping back rams for introduction later in the season, when most of the work has already been done. The few ewes which are then taking the ram are mostly those which have previously been tupped, but which have failed to hold. What is required is the reduction of these to a minimum, and if this is to be done it is important that sufficient rams be available during that busy time when most of the ewes are taking the ram.

A good idea might be to put out only a few rams for a start, watch these carefully, and introduce more as they appear to be needed. There seems to be little point in putting out all the rams together, if these are merely to spend their time at first battling with each other and exhausting themselves while competing to serve the few ewes that come on heat at the very beginning of the season. Also, of course,

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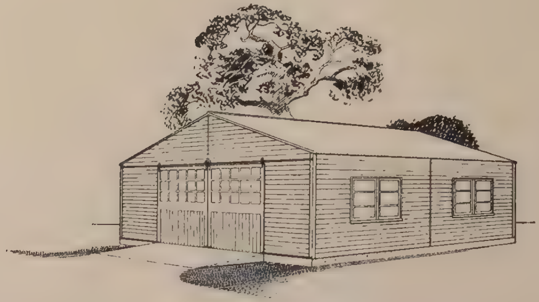

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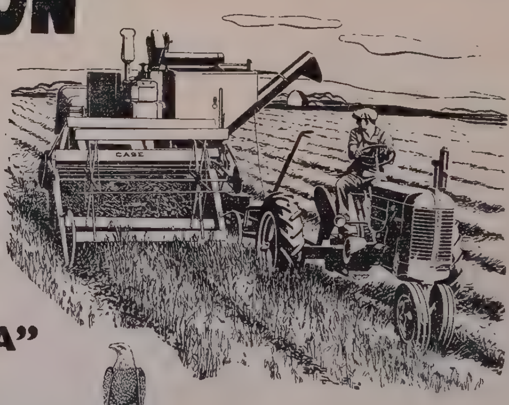

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there is no point in putting out rams that are infertile; hence the importance of having all rams expertly examined before the beginning of the tupping season. Veterinary facilities for this are now available in most districts.

Flock Management in Winter and Spring

On most properties carrying capacity is limited by the number of stock which can be wintered. This number will be low if the farmer has to rely solely on the amount of pasture grown by old, unimproved pasture species during the cold months of June, July, and August. One obvious approach is to adopt an annual programme aimed at renovating old pastures and sowing down new ones, but much can also be done by a carefully planned grazing regime.

It has been established that the rotational grazing system will throw a great deal more feed than the set-stocking one. This is particularly true during winter, normally a time of feed shortage. Pastures set-stocked through winter have everything against them. Close and continuous grazing rapidly exhausts the root reserves, and the fact that the pastures are bared down to ground level means that ground temperatures are lower than they would otherwise be. Growth is slowed down for both these reasons. The rotational grazing system, with the substantial intervals between grazings, allows root reserves to be built up, and the cover developed helps to keep up ground temperatures. For both these reasons a more rapid recovery occurs after quick grazing-off.

One general principle which cannot be stressed too strongly is that before and also during a period of feed shortage, policy should always be to graze rotationally. The rotational grazing system is advocated for periods of shortage, not only because it is the system which throws most feed, but also because it is a system which inevitably results in the accumulation ahead of the flock of feed reserves which can be used to even out the supply.

On farms where rams are put out toward the end of February it is essential that flushing be continued until the end of March, but during April, May, and June the ewes may be grazed quite hard without disadvantage. During the first 3 months after a ewe gets in lamb the developing embryo is quite small and the additional requirement of food for pregnancy is negligible. April and May are the 2 months during which there is almost always good growth, and it is essential, if really high carrying capacity is to be achieved, that an effort be made to conserve part of this growth to carry forward into winter. The flock requires less feed in April and May than in July and August, but pasture growth does not conform to this requirement. However, the farmer by using rotational grazing during April and May and also during winter can allow for this situation, ration his flock according to their requirements, and avoid any fall in their plane of nutrition as lambing time approaches. If this is done, complaints such as sleepy sickness are completely avoided.

A set-stocking system is recommended when grass begins to come away in spring, for the problem then is not, as a rule, one of feed shortage, but usually one of keeping feed under control so that it remains of good quality. Set-stocking delays as long as possible the time when the pasture runs off to seed head and becomes coarse and fibrous. The set-stocking system grows less feed and hence is best under these circumstances.

There is much to be said for the practice of going through the flock at the end of April, when the ewes should have had a month's hard grazing, to pull out ewes in low condition. These can be rotated ahead of the main flock. Also good is the practice of sorting up the flock into early and late lambing groups just before lambing is due to begin. Early lambers can then be given preferential treatment.

The practice of drafting out ewes with twins is obviously one which must be encouraged. Ewes with singles may be done fairly hard for 2 or 3 weeks after lambing without much disadvantage, for such ewes are capable of producing at this time rather more milk than the lambs can consume. This is not the case for ewes with twins. The growth of twin lambs is definitely limited by the amount of milk they secure from the ewe. Hence the need for preferential treatment. After the twin lambs are about 6 weeks old they probably do better if run with the rest of the flock, provided of course that grass is no longer in short supply.

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The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Flock Management after Weaning

Early weaning in some ways considerably simplifies farm management. As soon as the first lambs have been drafted the remainder may be drenched and weaned on to specially prepared paddocks. They can be shorn at this time, if convenient. The ewes may be mouthed and culled when still in the wool, if desired, and shorn at leisure without the complications and tension which normally arise through the ewes having their lambs at foot. Some of the ewes culled may be sent to the works before the main fat lamb killing season begins.

Early attention can be given to the feet of ewes retained for breeding, and also these may be dipped in good time. The ewes may be run as one mob and used to trim up rough paddocks, which may then be allowed to come away fresh and grow a cover before the dry weather sets in. The value of this method is that while the ewes are being used for this purpose they are not competing with their lambs and becoming overfat as a result of consuming vast quantities of feed they do not require. This really valuable feed should be kept for the further growth of lambs, the fattening of cattle, and the flushing of ewes. During this period the ewes held over can be brought into the hard store condition desirable for their sound breeding performance. If early weaning is practised, there is no need to send away a second draft of lambs before about the end of February. If more farmers adopted an early weaning policy, it would help quite considerably in the spreading of killings more uniformly over the season.

Basic Requirements

These recommendations are easily summarised. When the objective is an efficient and profitable conversion of feed to wool and fat lamb it is basically important to achieve high carrying capacity, to secure a high lambing percentage, to breed the right type of lambs, and to wean the lambs early and carry them through to heavy weights after weaning. If the general policy adopted by the farmer and by the industry as a whole is not directed to doing each of these things, that policy cannot succeed in making fat lamb production as efficient and profitable as it could be. Heavyweight lambs may not be acceptable to the industry. If the emphasis is to be on lightweight lambs, much greater importance must be attached to high carrying capacity and high lambing percentages as the main aids in achieving maximum efficiency.

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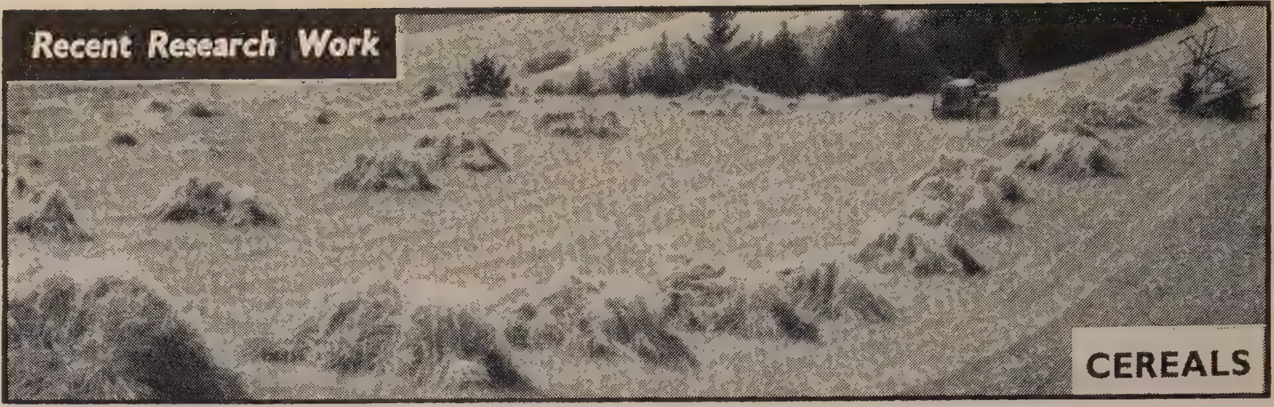


Recent Research Work

CEREALS

IMPROVED plants and improved soil fertility are both important in raising cereal yields. Plant improvement work is mainly carried out by the Crop Research Division of the Department of Scientific and Industrial Research, but the Extension Division of the Department of Agriculture has the duty of testing improved varieties and investigating soil fertility problems on a district basis. These notes detail the results of a recent fertiliser trial with oats and district trials with barley varieties.

FERTILISER TRIAL WITH OATS

A FERTILISER trial with oats has been carried out for 4 successive years at the Department of Agriculture's Invermay Research Station, North Taieri. This is a long-term project with the object of studying the phosphate and nitrogen responses in oats over a number of seasons. The results obtained so far show the variation in responses to fertilisers over 4 seasons. The oat crop is part of the rotation followed on the hill country at the station. Run-out browntop pasture is ploughed, limed at 1 ton per acre, and ridged in swedes. After the swedes are fed off, the paddock is ploughed or disced and sown in oats. The oats are followed by short-rotation ryegrass, and the paddock is ploughed again after 2 years for rape, which is followed by permanent grass. Thus the previous history of the 4 trials is similar, the oat crops following swedes ridged out of old browntop pasture. All 4 trials were laid down on the same soil type on the Invermay hill country. This is described by the Soil Bureau as a silt loam from drift over a yellow-grey mottled clay loam; it is strongly gleyed and has poor internal drainage. Owing to this, the soil becomes very wet in winter and is inclined to dry out rapidly in summer. The previous history of the area was very similar in each trial. Old browntop pasture was ploughed the year before and ridged in either swedes or soft turnips, which were sown with 3cwt. of phosphate (superphosphate, reverted superphosphate, and borated superphosphate). Lime at 1 ton or 25cwt. per acre was applied during the working of the land after ploughing, except in the first trial (1949-50), when no lime was used. Abundance was the variety sown in these trials and also in the paddock crop. The seeding rate was 120lb. per acre and the trials were sown with the paddock crop, usually in the first half of October.

TREATMENTS AND YIELDS

The manurial treatments applied and the yields obtained over 4 years are presented in the following table, which gives yields of control (with no fertiliser) and differences from control, both in bushels per acre. The differences are increases over control unless preceded by a minus sign, which means that yield was less than that of control.

	1949-50	1950-51	1951-52	1952-53
Yield of control	65.5	85.4	63.2	75.8
Differences from control—				
Superphosphate cwt./acre				
(a) 1	16.1	29.6	—4.2	14.1
(b) 2	29.9	34.2	—6.0	7.6
(c) 3	33.7	39.6	—5.6	24.4
(d) 2 + 1cwt. of sulphate of ammonia	27.1	32.4	10.4	36.1

DISCUSSION OF RESULTS

In each season except 1951-52 there has been a significant response to 1cwt. per acre of superphosphate over no phosphate and significant response to 3cwt. over 1cwt. of superphosphate. These results show the need for phosphatic fertilisers on this type of hill country ploughed from browntop pasture, even though the intervening brassica crop had had a dressing of 3cwt. of phosphate. A response to nitrogen was obtained only in the last 2 years (1951-52 and 1952-53). Both these growing seasons had above-average rainfall, which may explain the response. The treated plots changed to a dark green soon after the application and growth was 3 to 4in. higher than that of the no-nitrogen plots at harvest. The sulphate of ammonia dressings in the earlier seasons had no effect on yield and no visual response was observed in the crop. The lack of a phosphate response in the 1951-52 season is difficult to explain. The soil analysis for this trial showed a pH of 5.1 compared with an average pH of 5.6 to 5.8 for the other trials. Also that season was one of very high rainfall, 8½in. falling in November and December and causing severe waterlogging of the soil. These conditions may well have caused the lack of a phosphate response.

—*J. N. FITZGERALD*

* * * *

BARLEY VARIETIES

BARLEY is grown primarily for malting. In this use quality and uniformity of grain are of particular importance and the older varieties such as Plumage Archer, Spratt Archer, and Golden Archer were satisfactory in both these respects. With the tendency to seek high yields, irrespective of quality, many of the better malting varieties have been replaced by Research, especially on the poorer and lighter barley-growing areas. The poor malting quality of Research is possibly due in part to the fact that the original commercial lines were composed of a mixture of types of differing maturity. Selections of these have been made and early and mid-season types have been put under trial. The introduction of the Scandinavian variety Kenia on a commercial scale has focused attention generally on short-strawed types of reasonable quality and several of these types have been under trial. The ability of Kenia to yield, its short straw, which resists lodging (a weakness with all previous varieties on good land), and the fact that for a number of years it has been direct headed with success have combined to make this the most popular variety today. It is probably more suited to heavy land, although there is not sufficient evidence from Divisional trials so far conducted to justify fully the selection of varieties according to soil types. In the comparison of other Scandinavian varieties, Rigel, the only one yet grown on any scale in New Zealand, appears very weak in the neck; Maja and Herta appear to be similar to Kenia, but Maja may be less subject to neck-break. All these varieties, which have given good heading results in the past, are subject to severe loss if exposed to high winds between ripening and harvest. In this respect the mid-season selection of Research is more promising. Although taller strawed than the Scandinavian varieties, it is relatively strong and does not suffer to the same extent from neck-break. In a comparison of Kenia and the mid-season selection of Research in 16 Departmental trials over 4 seasons, mid-season Research has significantly out-yielded Kenia in 5 trials and in only one has Kenia significantly out-yielded mid-season Research. Kenia appears to be of higher malting quality. The early maturing selection of Research has proved to be lower yielding and has been discarded. Certified seed of both Kenia and Research is now available, the strain of Research under certification being the mid-season one.

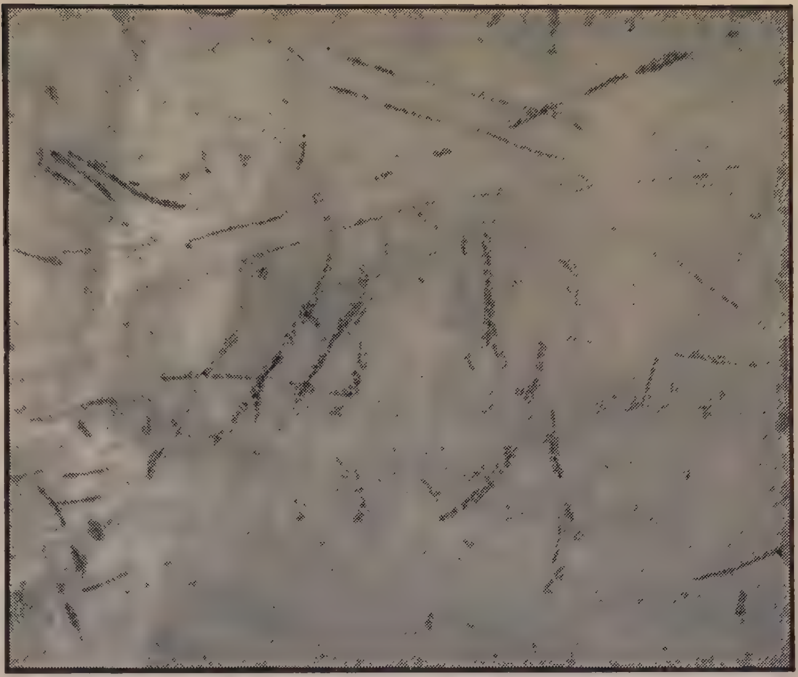
—*W. R. LOBB*

Damage to Hides and Skins

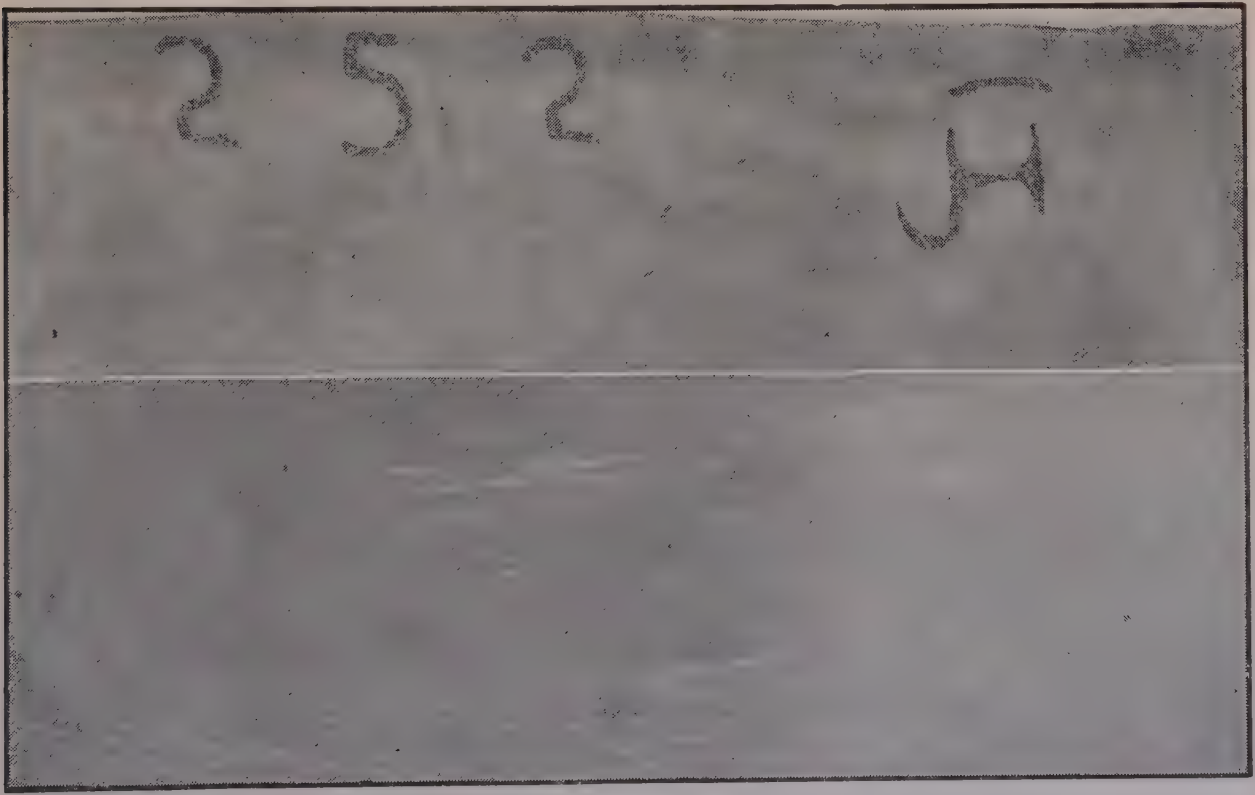
FIRE branding that is unnecessarily deep, use of large brands, and branding on the backs of beasts continue to cause much unnecessary waste of leather in New Zealand. Considerable damage also results from scratches caused by barbed wire, goring from horns, and careless handling on farms, during transit, or at freezing works and abattoirs. Many examples of this damage have been collected by the New Zealand Leather and Shoe Research Association and were shown to a farmers' conference at Massey Agricultural College, Palmerston North, recently.

AN unfortunate aspect of damage to hides and skins is that it is not apparent until the process in tanning which removes the hair is completed. Tanners are forced to proceed with tanning of damaged hides in the same manner as with clean skins, because it is not economic to reject them at the stage at which damage shows. From experience tanners know that a percentage of hides will be damaged and when processed less valuable, and consequently the price of all hides is affected.

Officers of the Leather Research Association state that fire brands are



A bobby calf skin badly scored by scratches which were caused by rubbing against a barbed wire fence.



Upper—Excessively large and deep brands. The number on this hide spread about 12in. and the letters at right were burnt deeply into the hide. Brands should be kept as near as possible to the minimum required by the Stock Act. Lower—A bend, the best part of a hide, showing long barbed wire scratches. Such damage restricts the use to which the leather can be put and increases the cost of finishing the leather.

often excessively deep and some are absurdly large. Both faults cause waste of leather, which becomes accentuated if the brand is on the back. The back and sides of a beast yield the bend, the best part of the hide. Brands therefore should be placed on the shoulder and the irons used should be kept as near as possible to the minimum 2in. required by the Stock Act.

Barbed wire is responsible for scratches which can seriously deface a hide or skin. There is evidence of such damage on numbers of bobby calf skins, which are used widely for shoe uppers and other purposes where the leather is displayed. Skins are useless for such goods if the leather shows deep scores and it then has to be used where the disfiguring and weakening effect of such scoring does not matter.

Damage caused to hides by horns can be advanced as another reason for dehorning.

A poorly shaped sheep skin. Such skins are wasteful for making up and every effort should be made to keep skins as square as possible.

Poor Shape of Skins

A large number of animals are slaughtered on farms each year and the skins from these would often bring better prices if more care were taken with butchering. Faulty work with the knife often leaves irregular shaped pelts, which are wasteful for making up into leather goods. Every effort should be made to keep skins as "square" as possible.

Damage Could be Reduced

Because to some extent cattle and sheep have to be used in New Zealand as "implements" for developing land, accidental damage to hides and skins is inevitable, but too much damage can still be attributed to avoidable causes. Experimental work which the Leather Research Association is pioneering in New Zealand may lead to leather trade procedures which can offset to some extent the initial defacing of hides, but returns to farmers for skins will be affected only by their efforts to reduce the incidence of damage which occurs on the farm or between the farm and the tannery.

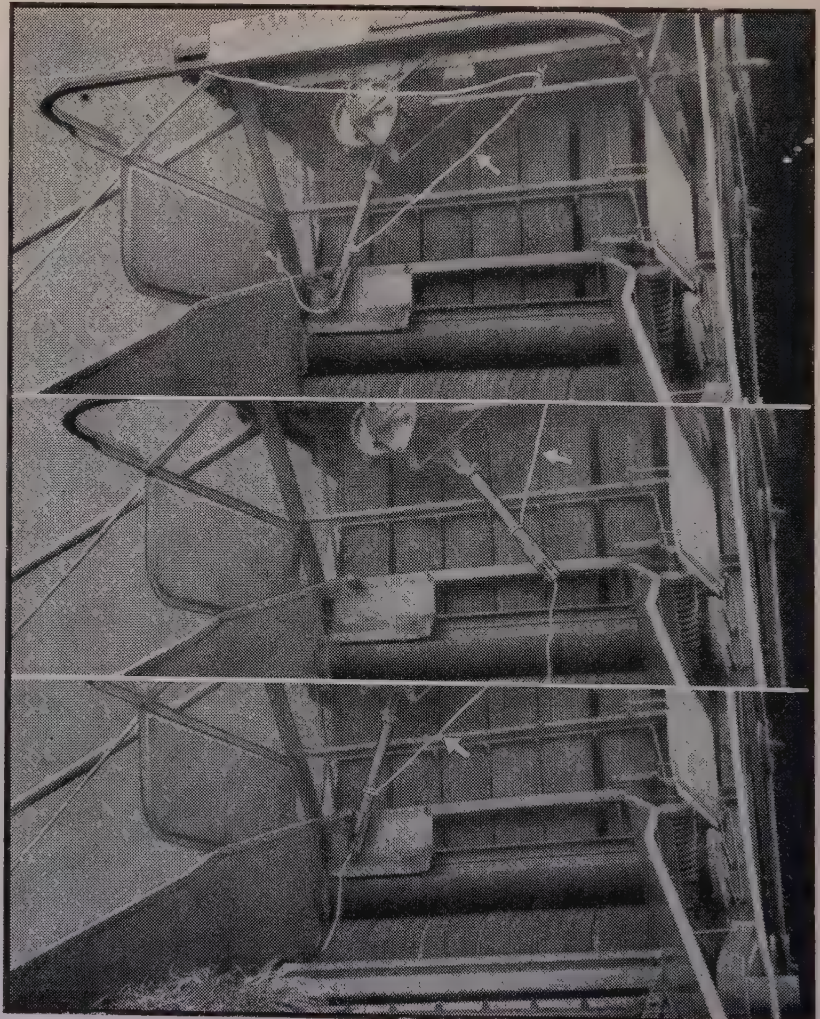
Photographs by Department of Scientific and Industrial Research.

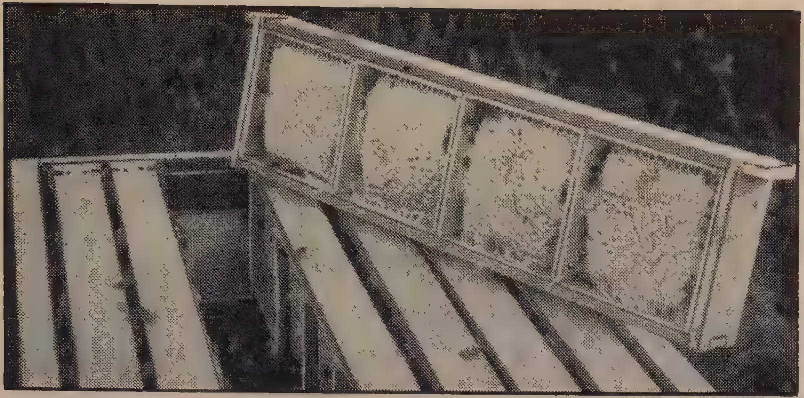
Overcoming Tying Failure in Roll Baler

AN attachment which a Kaikoura farmer has fitted to his roll hay baler to overcome a twine tying trouble which sometimes occurs is illustrated at right. A strong cross wind will at times cause the string to blow sideways and it may flip up over the side of the feeder platform so that it is not caught by the hay on the press roller and taken in to tie the bale. When this happens with standard machines the only course is to stop the tractor, stop the baler by putting **the power take-off out of gear**, dismount, and walk to the feeder platform and correct the position of the string.

However, with the attachment illustrated the tying trouble can be corrected from the tractor. A cord (indicated by arrows) is tied to the lower end of the twine tube and is led up through a small pully fitted to the hood of the baler and thence to the tractor seat. By merely pulling this cord the driver is able to move the twine tube sideways so that the twine (previously caught on top of the side sheet of the feeder platform) is pulled back into its correct position. Then a pull on the cord to the right-hand trip crank causes more hay to move up and take the twine into the bale chamber. This attachment is strongly recommended to all operators and owners of roll balers because it is felt that it will do much to correct a condition which operators are sometimes tempted to rectify in ways which expose them to risk of injury.

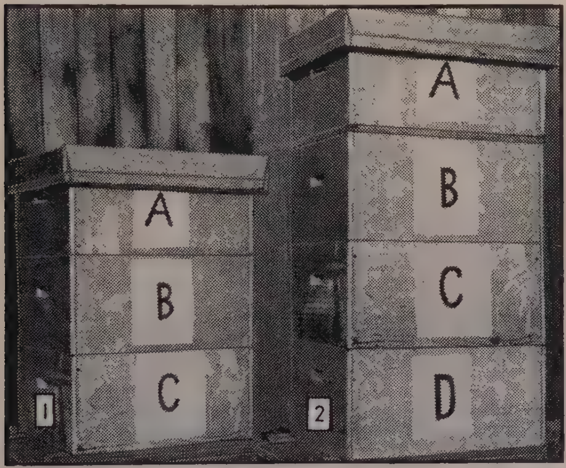
—*C. J. CROSBIE,*
Machinery Instructor,
Department of Agriculture,
Christchurch





Production of Section Honey

ALTHOUGH the bulk of honey produced in New Zealand is sold as extracted honey, there is a growing demand by the public for section honey in the comb because of its freshness and delicate flavour. In this article F. A. Bartrum, Apiary Instructor, Department of Agriculture, Christchurch, describes a system used by Mr. T. Grieves, Hawarden, North Canterbury, in the production of section honey.



1—Strong colony with three boxes of brood and bees. 2—Super D of foundation is added; also excluder below box A. 3—Super A of brood and bees is placed at back. 4—Bees and queen are shaken from boxes B and C into entrance of front hive and supers placed on back hive. 5—After about 12 days back hive should be shifted away and the back of section-producing hive opened to catch the field bees.

TO enable the system to work efficiently it is essential to have a hive with a young queen and built up to at least three boxes of bees at the beginning of the main honey flow. An indication of the first signs of the main honey flow is when nectar will shake freely from the combs. Although some variation in manipulations of different-sized colonies would have to be made, the following is the procedure used on a three-storeyed colony.

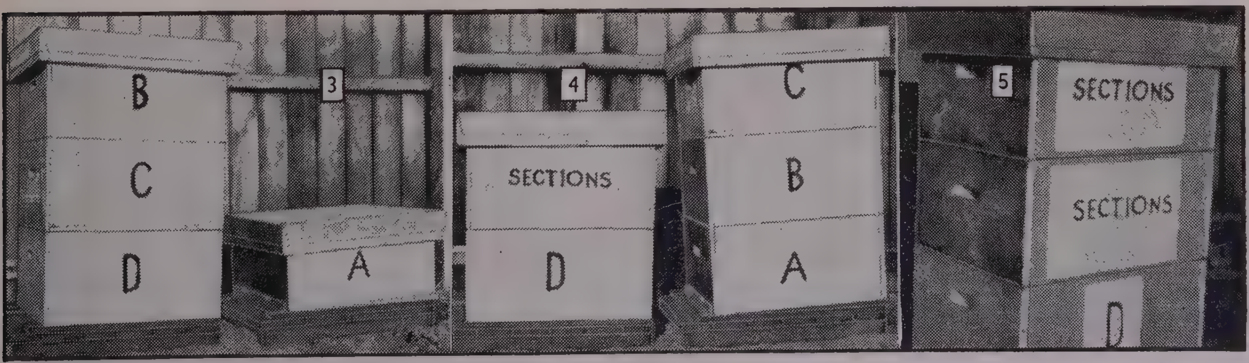
All three hive boxes of brood and bees (Fig. 1) should be removed and a box of foundation (D, Fig. 2) placed on the bottom board with an empty drawn comb on each side. The original supers of brood and bees should be replaced on top of this, an excluder being placed below the top super containing brood (A, Fig. 2), care being taken that the queen is not in this super. Although it is not essential, the hive can be left in this position for a day to allow the field bees to become accustomed to passing through the box of foundation.

A bottom board should be placed at the back of the hive with the entrance facing the back of the original hive. The top super (A) of brood and bees should be removed and placed on the bottom board (Fig. 3, right). The front entrance of A should be blocked completely and an entrance made at the back by placing wedges under each side of the super. The normal entrance is blocked temporarily by pushing grass into it so that when the grass withers and dies an entrance is automatically formed. During the same operation boxes B and C with the bees and queen in are put aside. A box of sections should be added to box D (Fig. 4, left). The bees and queen are then shaken from boxes B and C down in front of the original hive (D) and the two boxes are then replaced on hive A (Fig. 4, right) where there will be sufficient bees to attend to the extra brood. This colony can either be given a queen cell or left to raise a queen for itself.

After about 12 days the back hive should be shifted a short distance away in the apiary and the front hive propped up on wedges to provide a back entrance to it. In this way all the field bees from both hives will congregate in the front hive and assist in the production of section honey. During this operation an extra box of sections will have to be added to the front hive (Fig. 5) to cope with the additional field bees, as it is remarkable how quickly a hive will complete a box of sections with ideal weather conditions.

As no queen excluder is used on the section honey hive, it is necessary to use starters only in the sections to deter the queen from laying in them. The two empty drawn combs are placed on each side of the box of foundation to induce the queen to lay right across, as this will assist in having the sections built out evenly. The made-up colony with its young queen can either be used as increase or united back to the original colony at the end of the season.

Although these directions may at first appear to be complicated, they are comparatively easy to operate, and result in excellent quality and quantity of sections being produced.



Care of Livestock during January

Contributed by the Animal Research Division

WEANING LAMBS

WEANING is an important event in the life of a lamb and special care at this time will be well repaid. Long-wool lambs should be shorn and all others crutched. Weaning is the most important time for drenching against worms, which is especially necessary in wet summers. A full dose of 20 gm. of phenothiazine should be given. If fattening crops are not available, lambs should be drafted into "clean" paddocks after being drenched. Lambs should never be weaned into paddocks in which ewes and lambs have been grazed during the previous month. Unless very good paddocks of spelled pasture are available, hoggets should be spread thinly over as large an area as possible.

CULLING OF EWES

After lambs have been weaned the ewes should be gone through carefully to select those which require culling. Feet and wool should be examined carefully. Special attention should be paid to udders and teats, and ewes should be culled if they have defective udders or very large or damaged teats, as the lambs of such ewes often die from starvation before they are a week old. On good fat lamb farms too much attention is often paid to teeth. Provided ewes are in reasonable condition and have sound udders and good fleeces, they should be retained. Even "gummy" ewes will rear satisfactory lambs on good pasture. Lambing percentage increases with the age of the sheep and reaches the highest level when the ewes are 5 to 8 years old. Many ewes on fat lamb farms could well be kept for 1 or 2 years longer, but fat ewes which have not reared a lamb should be culled. Ewes should be kept on low rations for 2 months after weaning to prevent their becoming overfat.

ERADICATION OF FOOT-ROT

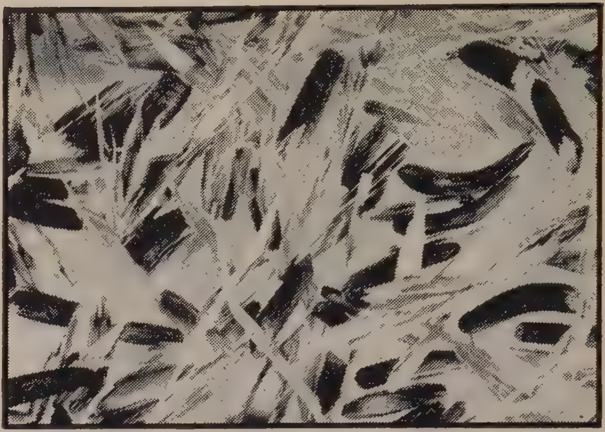
Campaigns for foot-rot eradication should be started as soon as the lambs have been weaned. Once foot-rot has been eradicated from a flock it does not recur unless it is reintroduced from outside. Department of Agriculture Bulletin No. 325, "Foot-rot in Sheep Can be Eradicated", gives instructions for such campaigns.

FODDERS FOR LAMB FATTENING

Rape should not be grazed by lambs until the leaves show a purplish tinge. "Unripe" rape does not fatten lambs so quickly and seems to "scald" them more readily. Best results are probably obtained by grazing rape in breaks which last the lambs about a week. Keeping lambs on a break until the last leaf is eaten is false economy; they should be moved on while they are still getting a full feed, and the paddock can be cleaned up with ewes. Run-offs have little to recommend them, and unless they contain good pasture they will depress the lambs' rate of growth. If hay is fed, it must be of the best quality. Thousand-headed kale is splendid lamb-fattening fodder, but because it is relatively unpalatable it must be managed properly. It must always be fed in small breaks and grazed only lightly before the lambs are moved on to the next break. Use of a run-off is not advised. Treated in this way, kale makes excellent regrowth and can be grazed several times; if necessary, grazing can be extended into autumn and winter.

ST. JOHN'S WORT MAKES DIPPING DANGEROUS

Sheep that eat St. John's wort become sensitive to sunlight and develop scabs on the ears, face, and back. If sheep in such a condition are dipped, they take convulsions and may be drowned. If possible, sheep should be grazed on country free from St. John's wort for several weeks before they are dipped. If that is not possible, they should be dipped only on dull days.



Ergotised hay can be easily recognised by the black ergots which replace the seeds of ryegrass and other grasses.

ERGOTISED GRASS MAKES DANGEROUS HAY

Serious lameness in cattle can be caused by their eating hay heavily infested with ergot. Such hay can be easily recognised by the black ergots which replace the seeds of ryegrass and other grasses. Where ergot is known to occur hay should be made before the grasses have time to seed.

DIPPING OF SHEEP

Modern sheep dips are so effective that the eradication of lice and ticks should be quite feasible. However, best results will be achieved only if the instructions for mixing and replenishing dips are followed accurately. Carelessness in dipping can cause disastrous losses. If sheep are dipped off shears, the shear cuts are likely to become infected and deaths from blood poisoning may occur, but this can be prevented by vaccinating the sheep with blackleg vaccine at least a fortnight before dipping them. The vaccine is available at a reasonable price. Veterinarians or Livestock Instructors should be consulted about its use.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during October and for the 3 months ended 31 October 1953, with comparative figures for the same month and 3-monthly period of 1952, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	Percentage inc. or dec.
October 1953	21,305	412	21,717	—
October 1952	23,470	417	23,887	—
Increase or decrease ..	—2,165	—5	—2,170	—9.084
3 months ended 31/10/53	46,763	845	47,608	—
3 months ended 31/10/52	48,822	806	49,628	—
Increase or decrease ..	—2,059	+39	—2,020	—4.070

Butter in store at 31 October 1953 was 12,638 tons

CHEESE

Period	White	Tons Coloured	Total	Percentage inc. or dec.
October 1953	12,166	11	12,177	—
October 1952	13,188	12	13,200	—
Increase or decrease ..	—1,022	—1	—1,023	—7.750
3 months ended 31/10/53	21,517	29	21,546	—
3 months ended 31/10/52	22,070	19	22,089	—
Increase or decrease ..	—553	+10	—543	—2.458

Cheese in store at 31 October 1953 was 8,283 tons

If these figures are converted into butterfat equivalent, there is a decrease of 3.801 per cent. in butterfat graded for the 3 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Summer Fallow: Seed Mixtures for Manuka Burns

Seasonal Notes by the Extension Division

SUMMER fallowing before autumn sowing of pastures is now a fairly common practice, as it enables the seeds mixture to be sown on a firm, moist, and warm seed-bed. Early autumn sowing allows quick establishment of grasses and clovers and the first feeding off of the pasture to be carried out before the land becomes really wet in the winter.

CULTIVATION

A fundamental principle to observe in summer fallowing is to complete all deep working as early in the season as possible while soil moisture is plentiful. Subsequent cultivation should be confined to surface working with roller and harrows, a loose tilth being left at all times on the top inch or so to prevent excessive moisture loss. A rolled surface will lose more moisture than a harrowed one. Obviously it is impossible to eliminate all weeds to the full depth of the plough sole, so efforts should be directed toward destroying those likely to compete with the subsequent pasture, namely, those in the top 2in. The aim should be to provide a seed-bed in which they can germinate and then to kill each successive strike with a timely stroke of the harrows. A cultivation programme based on these principles will result in an effective fallow.

TWITCH CONTROL

In direct contrast to a fallow before pasture establishment, a twitch control fallow should aim at drying out the soil as thoroughly as possible. Repeated exposure to sun and wind is the only effective means of achieving this. If the ground is rough and lumpy, a greater area is exposed than if it is fine and compact. The problem is therefore to work the ground often and yet keep it rough. The plough is the one implement capable of doing this and is therefore the most suitable for twitch control. The recommended practice is to plough as often as possible, the previous finishes being struck down each time. In this way the furrow is rolled back and forth, first one side and then the other being exposed to the sun. The first ploughing should be comparatively shallow, as each subsequent ploughing inevitably goes a little deeper. Repeated working is necessary before the furrow is thoroughly dried.

—M. S. FOREMAN

[A description of the chemical control of twitch is given on page 520.]

* * *

SEED MIXTURES FOR MANUKA BURNS

WITH the more general use of phosphatic fertilisers on hill country more reliance is now being placed on regrassing manuka burns with perennial ryegrass and clovers. Manuka burns should be sown immediately after the burn with a suitable seed mixture together with 3cwt. of phosphatic fertiliser. The phosphate topdressing is just as important as sowing the seed, because usually manuka initially enters the sward because of lack of phosphate, a lack which manifests itself in a weak and open pasture which offers little resistance to the ingress of manuka. If a liberal dressing of phosphate is not applied, it is reasonably certain that the burn will go back into manuka after a few seasons. In selection of the seed mixture attention should be paid first to species of grasses and clovers that are most suitable to the location and second to the quality of the seed. The emphasis in sowing manuka burns should be on the clover, and a very liberal sowing of the clover species should always be made. White clover is the best of the clovers and where conditions suit it this should be made the dominant clover in the mixture. The grasses, particularly browntop and danthonia, re-establish to some extent after the burn because the fire is seldom hot enough to kill them. On light manuka burns where danthonia and browntop are present it is unnecessary to sow further seed of these species.

LOTUS MAJOR

In the higher-rainfall areas *Lotus major* should be relied on as the main legume in the seeds mixture. A suitable mixture is Permanent Pasture perennial ryegrass 10lb., crested dogstail 4lb., Yorkshire fog 2lb., *Lotus major* 1lb., and Permanent Pasture white clover 1lb.

WHITE AND SUBTERRANEAN CLOVERS

Over most of the North Island hill country white clover can be relied on to provide a good cover if it is regularly topdressed. A suitable mixture is Permanent Pasture perennial ryegrass 10lb., crested dogstail 4lb., Yorkshire fog 2lb., and Permanent Pasture white clover 3lb. On hill country where conditions are too dry for perennial clover subterranean clover should be used as the main legume, and even on the wetter country it is often advisable to include it in the mixture. A suitable mixture for drier country is: Permanent Pasture perennial ryegrass 5lb., *Danthonia pilosa* 4lb., Permanent Pasture cocksfoot 6lb., subterranean clover 4lb., and suckling clover 1lb. The Permanent Pasture grade of Certified seed is quite satisfactory for sowing on burns.

—A. A. DUNCAN

* * *

HARVESTING SUBTERRANEAN CLOVER SEED

SUBTERRANEAN CLOVER is not an easy crop to harvest, for it either buries its seed burrs in the soil or covers them completely with a mass of herbage. Harvesting is simplified if a heavy growth of pure clover herbage is present, as most of the burrs are then held above ground level. Whether or not all burrs remain above ground level, they are always well under cover, and if adverse weather prevails after maturity is reached, the seed is kept moist and germinates readily. A normally dry summer and early autumn ensure reasonable chances of success. The most common method of harvesting subterranean clover seed is by use of the dump-type hay rake without any prior mowing. This method can be used under most circumstances, though it is unsuited to paddocks where surface stones would be dislodged by the rake. The implement used is the old type of dump rake with stiff tines. The clover is allowed to become dead ripe and harvesting is normally carried out in January or February before the onset of the autumn rains. Best results are obtained from raking when the herbage is moist with dew or light rain. This temporarily toughens the fragile stems bearing the seed heads and any burrs having a loose hold on the soil are dragged out. The material is raked into windrows and is then allowed to dry out thoroughly before being threshed with the header harvester or clover huller. As the seed is fairly difficult to dislodge from the burrs, a period in stack facilitates threshing.

The correct degree of moisture to have in the herbage before raking can be judged only from experience. Just sufficient to toughen the stems is required. If the herbage is excessively moist when it is raked, a protracted drying period in the windrow is necessary. Some farmers carry out the operation when the crop is quite dry, and though seed losses are greater under these circumstances, yields can still be quite satisfactory. When herbage growth is very heavy the crop may be cut with an ordinary mower with or without lifting fingers attached. Use of these fingers results in fewer burrs being detached from the stems. Dew or other light moisture on the herbage at cutting time strengthens the tiny stems bearing the burrs and so prevents loss of seed. The crop may be threshed either from the swath or after stacking. A header harvester or clover huller is used, the material normally being put through twice. Direct heading is feasible when a good heavy mat of herbage is present and if the crop is dead ripe and dry and the passage of the header harvester very slow. Lifting fingers are attached to the cutter bar and the herbage is drawn into the drum in a continuous mat.

—J. P. BEGGS

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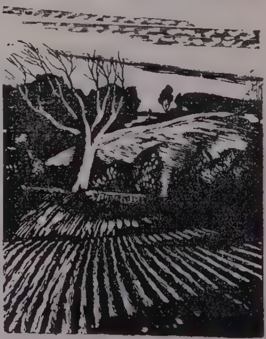

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THE SHELL COMPANY OF NEW ZEALAND LIMITED
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HEADING PHOTOGRAPH: At the beginning of the century Hawkes Bay produced all the flour the province could use. During the Second World War more than 4000 acres of wheat were grown in one season, but last year only 600 acres were sown to the crop. National Publicity Studios photo.

Wheat Production in Central Hawkes Bay

By F. H. COLLIN, Fields Instructor, Department of Agriculture, Hastings

ONE of the major problems facing the world today is the enormous task of producing sufficient food to meet the demands of an ever-increasing population. New Zealand is in the happy position of being self sufficient in almost all branches of primary production. Undoubtedly the most important exception is wheat. The annual consumption of wheat in this country is approximately 12 million bushels, of which less than half is home grown, and this in spite of the fact that there is ample land in New Zealand capable of producing grain of good milling quality to meet the Dominion's own needs. In central Hawkes Bay alone, with its adequate rainfall and dry summer conditions, there are thousands of acres that could advantageously be used for the growing of wheat.

AT the beginning of the century Hawkes Bay produced all the flour the province could use, with a surplus for export. During the Second World War farmers were encouraged to increase their wheat acreages, and over 4000 acres were grown in one season, most of which produced above-average crops. This clearly shows how well suited the province is to the production of this vital commodity. Yet with the increased prices for meat and wool in recent years, the acreage devoted to wheat growing has steadily decreased, until last season only 600 acres were grown.

If drainage and cultivation are good, the requirements for wheat growing are not particularly exacting. All farmers practise a rotation of sorts, in which the prime object is the provision of winter feed. Considered in conjunction with the necessity of breaking up old pasture, wheat has a definite place in a well-balanced rotation on much Hawkes Bay land. The grass, to wheat, to grass method has been followed by most farmers on the medium- to low-rainfall areas as a means of establishing new pastures with reasonable results.

Renewal of Run-out Pasture

The type of farming practised in Hawkes Bay is mainly pastoral and the most important feature of farm management is the renewal of some run-out pasture each year. A simple rotation allows pasture to be renewed as quickly as possible, and the inclusion of a safe crop such as wheat is an assured source of income to the farmer and greatly assists in the preparation of land for the establishment of higher-producing pastures.

It is generally accepted that Hawkes Bay's arable land will support a crop of wheat every fifth or sixth year without depletion of soil fertility, and wheat can follow various crops or pasture.

On areas of light land with reasonable summer moisture spring sowings are generally adopted. Pasture grazing is obtained as late as July or August, after which the land is ploughed, cultivated, and sown in wheat in September. The area is sown down in new grass the following autumn.

Yields of between 40 and 70 bushels of wheat per acre are generally obtained, and these make wheat a profitable cash crop in central Hawkes Bay. There is no reason why average yields of 50 bushels per year and more cannot be obtained when wheat is included in a simple rotation.

Where a definite rotation is used wheat sometimes follows turnips, swedes, rape, or peas. Soil fertility can be increased by the use of a sound crop rotation which provides a proper balance between exhaustive and restorative crops. The most valuable restorative crop is good pasture. In a 5- to 6-year rotation pastures are of short duration, and if amply top-dressed, will give far higher production than those left down for an indefinite period. The effects of grass-grub attack on the short-termed, higher-producing pastures thus obtained are considerably lessened when modern chemical methods of control are used in conjunction with the high rate of pasture renewal.

Wheat Growing on Light Land

The following programme of a farmer on light land outlines the important part wheat plays as a profitable crop in a farmer's rotation planned to obtain higher-producing pastures.

The property, consisting of 2300 acres, is situated 12 miles due west of Waipukurau and adjoins the foothills of the Ruahine Range. It is approximately 1000ft. above sea level and frosts up to 15 degrees are recorded. The rainfall is about 44in., the greater part of which falls during winter and early spring. Summer rainfall is adequate but not high enough to hinder harvesting operations.

The farm is divided into 40 paddocks ranging in size from 30 to 80 acres. Approximately 800 acres are flat and it is on this country that the crop rotation is practised. The remainder of the farm is undulating to hilly and is used solely for grazing. Though

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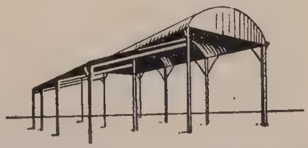

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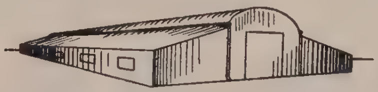

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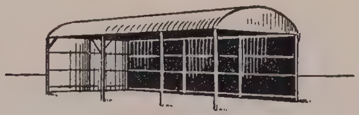

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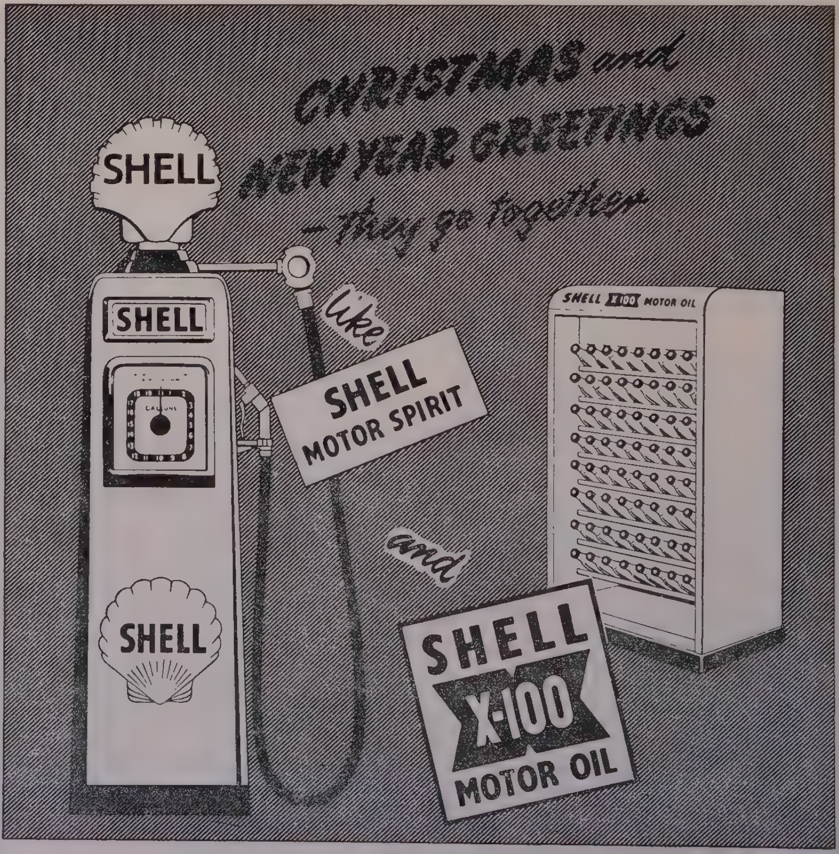

THE SHELL COMPANY OF NEW ZEALAND LIMITED (INCORPORATED IN ENGLAND) S4-30 this steeper country has been improved by topdressing, resowing, and oversowing, its topography and heavy clay subsoil render it unsuitable for wheat growing.

Soils

The land used in the rotation consists of silt and sandy loams which are light, fluffy soils and tend to dry out rapidly during summer. They are well drained owing to the presence of stony, gravel subsoils. In places gravel is close to the surface and deep ploughing cannot always be done. As the soils contain a proportion of volcanic ash, they are easy to work and when under cultivation break down to a fine seed-bed. Owing to their tendency to blow, the surface cannot be left too fine.

Left—Autumn-sown pasture (after wheat) being grazed by young cattle in July. Self-sown wheat provides an excellent cover for the young pasture sward and allows early grazing. Above—A close-up view of the same pasture showing strong growth of volunteer subterranean clover.

Crop Rotation

Before 1945 the usual district practice was adopted in which chou moellier or chou moellier and swedes for winter feed, followed by rape for fattening, were grown before new pasture was sown. Old pastures were dominant browntop and pasture improvement in conjunction with provision of winter feed was the major consideration.

With the laying down of new pastures containing subterranean clover and a high percentage of perennial ryegrass in the sward the damage by grass-grub became more widespread. Though crops of chou moellier and swedes produced good winter feed, rape crops were generally unsatisfactory. It became apparent that a change in management would have to be made.

Wheat then became the basis of a 5- to 6-year cropping rotation. It was felt that by substituting wheat for rape and by ploughing a larger proportion of the farm each year all stock could be successfully fattened on a higher-producing, younger type of pasture. The rotation is as follows: 1. Old pasture; 2. turnips and swedes; 3. wheat; 4. new pasture (4 or 5 years).

Preparation of Land

The present policy is to plough approximately 130 to 150 acres each year, half of which is sown in swedes and half in turnips. The land required for swedes is ploughed in early November, cultivated, and sown in

Below—The most important feature of farm management in Hawkes Bay's mainly pastoral economy is the renewal of some run-out pasture each year. Inclusion of wheat in a simple rotation greatly assists in the preparation of land for the establishment of higher-producing pastures.

mid-December. The turnip country is ploughed immediately after the swedes are sown and cultivated in a similar fashion and the seed is sown by early February.

Phosphate in the form of "super. compound" at 1½cwt. per acre is applied with the seed of both crops. As the land is subject to blowing, the cultivated surface must be left rough to reduce any loss of topsoil to a minimum.

These crops are fed off in rotation by hoggets, grazing usually beginning in May. After the crops have been consumed the areas are ploughed in mid-June to a depth of about 5in. They are then rolled and double disced. After an interval a further discing is given and then they are harrowed preparatory to drilling the wheat in late August or early September. Rolling after sowing is not practised, as trials carried out on the property over a number of years proved that rolling encouraged weeds.

Sowing and Manuring

In the opinion of the owners the sowing is the most important factor if a successful wheat crop is to be obtained. It is one operation that cannot be hurried. When the soil conditions and weather are suitable the wheat receives first priority and all other work on the farm ceases until it is sown. It has been proved that it is far better to sow late under good conditions than early under poor conditions. Poor strikes are obtained if the soil is wet and occasionally during a very wet season sowings are made in late September. Cultivation work is planned so that the land is ready for sowing as early as possible, generally at the end of August or early September.

Certified seed is always sown at the rate of 2 bushels per acre with 1cwt. of superphosphate. Heavier rates of phosphate have been tried with no resultant increase in yield. The seed is drilled in 7in. rows and about 2in. deep. At no time during the growing period is the area harrowed or grazed.

Varieties

The first varieties used were Cross 7 and Fife Tuscan, but as these are autumn to early winter sown wheats, they did not suit the rotation and the maximum grazing could not be obtained from the swedes and turnips. Tainui, Hilgendorf, and Yielder were all tried over a period and the variety best suited to the rotation and general management was Tainui. All varieties have yielded well, but during an adverse season when cultivation work was held up and late sowings were made Tainui outyielded the other varieties. It was found that on this type of country Yielder and Hilgendorf must be sown before September if a successful crop is to be obtained.

Harvesting

The crop is usually ready for harvesting at the end of January or in early February, depending on seasonal conditions. It is harvested with a header harvester, and yields of over 60 bushels per acre are not uncommon.

Sowing to New Pasture

After harvesting, the areas are lightly disced to cover all seed which may have fallen during harvesting. This self-sown seed acts as a cover crop for the new grass. The remaining stubble and straw are then burnt. Burning before discing was practised, but it was found that a better burn was obtained after discing. After burning, the areas are again lightly disced. This discing must be light; otherwise fallen grain may be brought to the surface.

A seeds mixture containing 30lb. of Certified perennial ryegrass, 3lb. of Certified cocksfoot, and 2lb. of Certified white clover is broadcast. Areas receive another discing to cover the seed but this time with no cut on the discs. The seed is broadcast as early as possible, generally in February. As most areas have a high proportion of subterranean clover in the pasture sward before ploughing, this species is added to the seeds mixture only where necessary.

The self-sown wheat gives ideal cover for the young pasture sward and allows early stocking, which is so desirable on this class of land, as consolidation is one of the most important factors if successful pasture establishment is to be obtained. This is done with young cattle, preferably weaners, and the areas are not grazed with sheep until September. As phosphate is the major element limiting good pasture establishment, applications of a phosphatic fertiliser are essential when sowing down new pasture. Between 1945 and 1950, 2cwt. per acre was used annually, but since the advent of chemicals in the control of grass-grub, the phosphate application is halved and made at two periods, 1cwt. at the time of sowing and the other in early spring.

The spring application comprises 1cwt. per acre of superphosphate containing D.D.T. for the control of grass-grub and is distributed through a manure box attached to a roller. To safeguard against the possible toxic effects of the insecticide, stock are removed from the time of application until later in the spring, when the areas provide ideal grazing for ewes and lambs.

The following autumn the areas are topdressed with a further 2cwt. per acre of superphosphate and 5cwt. of lime, thus making one application of lime and three applications of phosphate per acre in the first 12 months of the pasture's life. Through the summer months lenient grazing with cattle is practised to allow the cocksfoot to become firmly established. The area is then left in grass for 4 to 5 years until it is brought back once again into the rotation.

Rotation a Planned Routine

The whole rotation is a planned routine and the farmer knows exactly what he has to do at all times of the year. This system has been successfully operated since 1945 and at no time during this period has a crop of less than 50 bushels per acre been harvested. Added to this the grass-grub menace has been checked and the carrying capacity has increased from 1 breeding ewe to 2½ ewes per acre. More ewes could be wintered, but the owners favour a higher cattle ratio and are at present carrying 850 steers. They hope to increase this number to 1000 through this planned rotation of producing better pastures and thus being able to save more hay for winter supplementary feed. Wheat undoubtedly has proved a payable crop, and the farmers say: "It's the safest farming we know".

In central Hawkes Bay there are considerable areas of country similar to this that could be improved by the adoption of the same methods. By such practices farmers would not only be lifting their carrying capacities by as much as 1½ ewes per acre on light land, but they would also be contributing their share to the need for higher wheat production throughout the Dominion.

Meteorological Records for October

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	56.9	+ 0.1	72.3	36.5	12.10	19	+ 7.59	4.50	30	191.2
Auckland	160	58.0	+ 0.6	68.9	46.1	3.11	18	— 0.98	0.64	30	151.4
Tauranga	10	55.5	— 0.5	66.7	38.5	4.31	18	— 0.66	1.52	8	182.5
Ruakura	131	54.0	— 0.3	74.0	33.5	3.84	17	— 0.29	0.64	19	135.2
Rotorua	975	53.2	+ 0.4	73.0	33.9	3.62	17	— 1.54	1.14	8	157.5
Gisborne	12	54.6	— 0.9	78.0	31.3	2.26	13	— 0.17	0.67	14	207.1
New Plymouth ..	160	54.5	+ 0.1	69.5	38.5	5.81	19	+ 0.18	1.00	1	161.4
Kariol	2125	48.7	+ 0.5	71.0	30.0	5.32	15	+ 1.07	1.20	2	
Napier	5	55.8	— 0.7	75.2	33.0	1.33	13	— 0.57	0.57	2	194.7
Wanganui	72	54.8	+ 0.0	69.9	39.9	5.30	17	+ 2.08	1.16	2	148.2
Palmerston North .	110	54.3	+ 0.4	72.5	33.5	5.42	17	+ 1.86	1.28	9	145.9
Waingawa	340	52.0	— 0.7	74.8	31.0	3.91	15	+ 0.95	1.20	9	161.9
Wellington	415	52.4	— 0.4	65.9	37.6	5.53	14	+ 1.30	1.76	1	171.8
Nelson airfield ..	5	52.4	+ 0.2	66.5	35.2	2.69	15	— 0.65	0.82	8	196.8
Blenheim	12	53.6	— 0.1	73.8	35.9	3.70	14	— 1.50	1.42	1	204.2
Hokitika	15	50.9	— 0.1	63.2	35.8	7.66	13	— 3.36	2.88	1	175.9
Hanmer	1270	49.0	— 1.6	80.0	27.0	3.43	14	— 0.47	1.01	1	178.6
Christchurch ..	22	51.7	— 1.4	80.1	32.7	3.49	13	+ 1.54	1.06	9	152.5
Ashburton	323	51.2	— 1.2	83.6	28.0	3.71	9	+ 1.29	1.25	8	140.9
Timaru	56	52.2	— 0.5	72.9	29.9	1.89	8	— 0.04	0.96	8	164.4
Alexandra	520	52.0	— 0.4	82.1	27.1	0.11	3	— 1.11	0.07	8	237.8
Taieri	80	49.2	— 1.9	75.3	28.1	1.04	7	— 1.02	0.64	9	183.2
Invercargill airfield	0	48.2	— 0.8	71.1	27.2	1.28	6	— 2.20	0.78	18	188.6

Horticultural Production on Gisborne Plains

THE Gisborne district, on the east coast of the North Island about 150 miles north of Napier, is ideally suited to the production of horticultural crops. With improved transport facilities and successful flood control Gisborne may become one of the main producing districts for the supply of fruit and vegetables to the Dominion. In this article R. Viney, Horticultural Instructor, Department of Agriculture, Gisborne, describes the climate and soils of the district and gives details of present horticultural production and estimates of future development.

THE district was discovered by Captain Cook in October 1769, and he later named it Poverty Bay.

A trading station was established in Gisborne in 1870, when the township had a population of about 500. During the same year the town was surveyed, farm areas were opened up, and settlement of the district was begun.

In 1875 the telegraph line to Napier was completed and by 1886 the population had increased to 2300. The population of Gisborne town is now approximately 18,000.

The district was practically isolated owing to lack of transport until the railway to Napier was completed in 1942. Development has increased considerably since then, particularly in the growing of agricultural produce and fruit, vegetables, and other cash crops.

The first air service from Gisborne began in April 1935, but the value of an air-freight service was not fully established until 1948, when larger aeroplanes were required to cope with the increasing flow of passengers and freight.

Climate

The warm climate of Gisborne is well suited to the production of horticultural crops. The average annual temperature is 56.8 degrees and the average annual sunshine recorded is 2270.5 hours. The average annual rainfall for the district is 45in., but this is not usually very well distributed throughout the year.

Excess rainfall during late autumn, winter, and spring is generally followed by prevailing westerly winds, which predominate during October, November, and December.

The prevailing winds and low rainfall during these months often create drought conditions which may persist up to January or February. Heavy falls of rain are not uncommon and often cause flooding throughout the district.

Cold, southerly conditions during winter and spring are often followed by frosts. These are light compared with those in other parts of New Zealand, but occasional late frosts in October or November have caused damage to crops of potatoes, tomatoes, and citrus.

Wainui district on the east coast, about 4 miles from Gisborne, is entirely free of frosts, and Ormond district, 10 miles inland from Gisborne, has only very light frosts compared with those in Gisborne, where the heaviest frosts recorded were of 11.2 degrees in 1941 and 8.2 degrees in 1947.

Occasional summer hail storms have caused damage to crops, but these storms are usually confined to fairly narrow belts. The climate in Wainui and Ormond districts is particularly favourable for the production of early fruits, vegetables, and sub-tropical fruits.

Flood Damage

Probably one of the main factors restricting the full utilisation of land in Gisborne district is the danger of serious flooding of the Waipaoa River which occurs in some seasons.

Over 73 years 12 floods have been experienced, the largest and most damaging in 1948, when 21,000 acres of land were flooded, with damage estimated at £336,356. The average annual cost of these floods over 30 years is estimated at £25,400.

The Poverty Bay Catchment Board has begun a flood control scheme with the use of stopbanks and straightening of the present course of the Waipaoa River from its mouth to about 3 miles north of Ormond.

HEADING PHOTOGRAPH: Part of Gisborne and surrounding flats.

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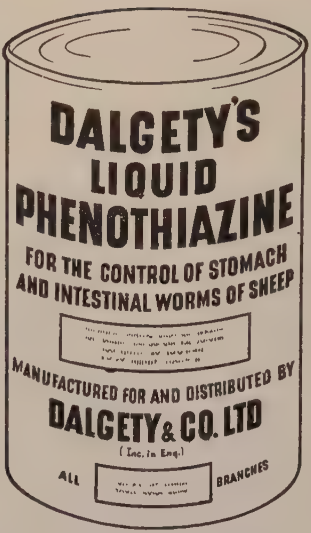
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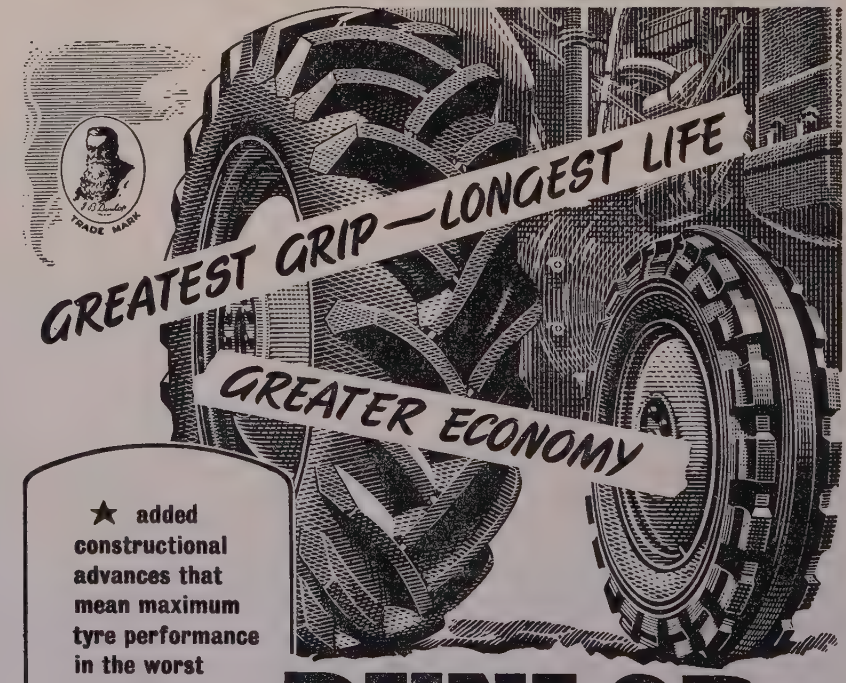
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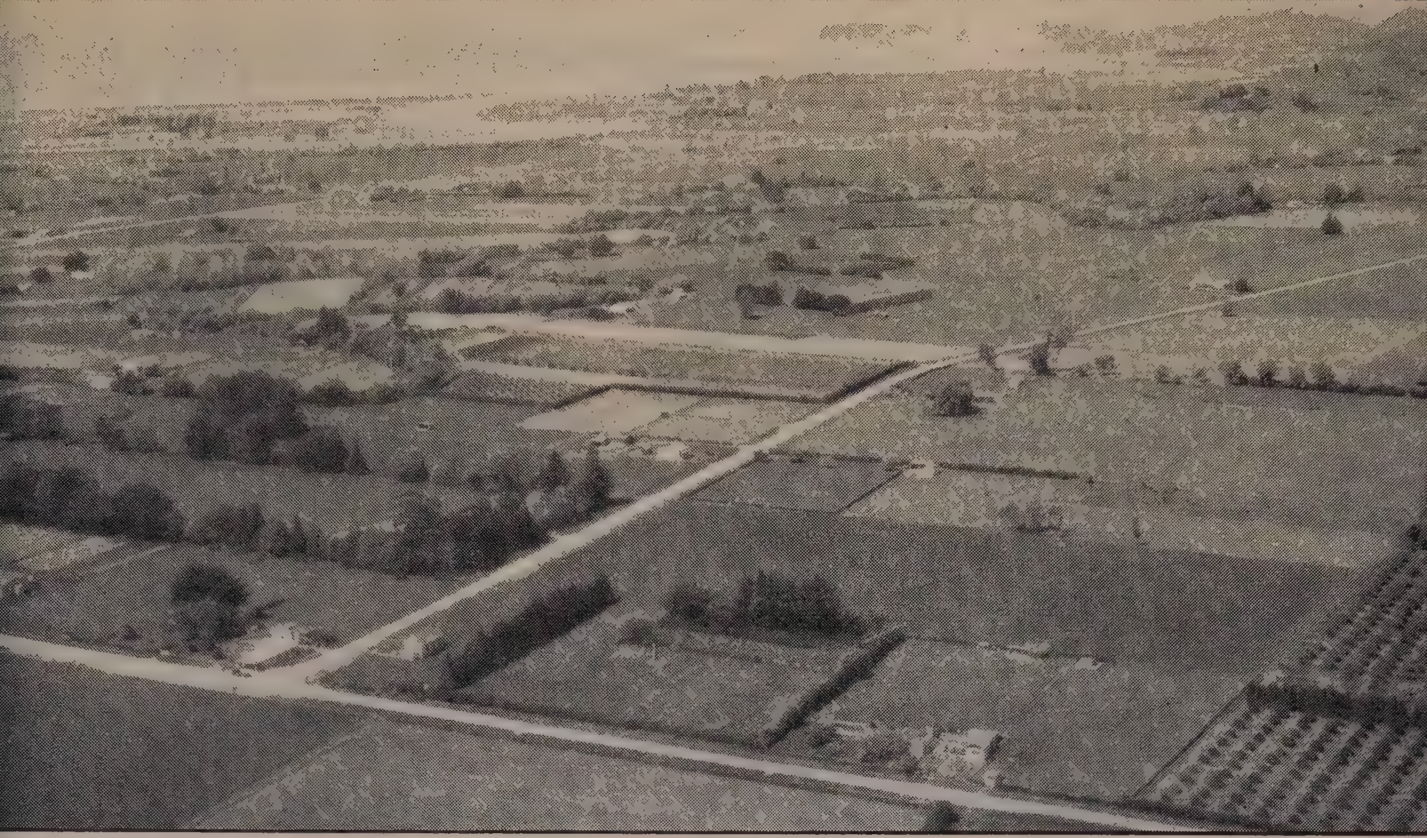

Part of Gisborne flats. Manutuke area is in the foreground and Young Nick's Head in the distance. A citrus orchard is shown at bottom right and a pip-fruit orchard in the middle distance.

At least half of the area which is liable to flood damage is suitable for the production of horticultural crops, and although an increase in land values may be expected with successful flood control, this should be offset by larger earnings per acre.

When the proposed scheme is completed at least 10,000 acres of first-class land previously subject to flooding should be suitable for growing horticultural crops, and an increase in productivity may be expected, as subdivision and a more intensive type of farming should follow.

Soils

The soils of the Gisborne flats vary considerably in type, but the majority have a high fertility. Most types are alkaline to slightly acid, but do not require lime and have a very high potash content and high phosphate content.

Most of the soil in and around the town is of a pumice and sandy nature, but with green manuring and the use of fertilisers some excellent crops are produced. Owing to its free-draining structure it is particularly suitable for the production of winter and spring vegetables.

The Gisborne flats, built up from the Waipaoa River, cover an area of 52,000 acres, and although some areas are of good texture and easy to cultivate, other areas are inclined to pug if cultivated while they are wet. During the current soil survey of the Gisborne Plains the Soil Bureau, Department of Scientific and Industrial Research, has mapped over 50 soils which have been classed in series, the utilisation of which is as follows:—

Waipaoa series: 6000 acres—suitable for maize, fat lamb, and beef production.

Matawhero series: 7000 acres—suitable for a wide range of crops, including market garden and orchard crops.

Opoutama series: 800 acres—the borough of Gisborne is built on a large part of this type, which is of a pumice, sandy nature.

Te Arai series: 3000 acres—suitable for a wide range of horticultural crops, including grapes, citrus, and stone fruits.

Waihirere series: 7000 acres—suitable for a wide range of crops, including market garden and orchard crops.

Makaraka series: 3500 acres—suitable for a wide range of crops, including market garden and orchard crops.

Makauri series: 5000 acres—suitable for market gardening, but difficult soil to manage.

Te Karaka series: 3000 acres—suitable for maize, fat lamb, and beef production.

Muriwai series: 1000 acres—this land is undeveloped and is liable to frequent saline-water flooding.

Kaiti series: 4000 acres—suitable for maize production and dairying. This is difficult soil to manage.

Te Hapara series: 3000 acres—loamy sand; most of this will be used for extension of housing and other urban development.

Included in the above are 23,000 acres which would be suitable for general horticultural production and several thousand acres of other land which under proper management would also be suitable for some horticultural crops.

Market Gardening

In 1920 the area in market garden crops was 60 acres, which by 1948 had been increased to 439 acres.

By 1952 the area had increased to 1500 acres, mainly owing to the establishment of a branch of J. Wattie Canneries, Hastings, in the district.

In the first year, 1952, the cannery processed sweet corn from approximately 1000 acres, from which an average yield of 4 tons per acre was harvested. In more favourable areas yields of up to 7½ tons per acre were obtained.

In 1953 approximately 2500 acres were producing market garden crops and 1000 acres of peas, 550 acres of sweet corn, and 80 acres of tomatoes were grown for canning.

Yields of up to 3 tons per acre of peas, 8 tons per acre of sweet corn, and 20 tons per acre of tomatoes were expected, but these did not eventuate owing to a cold and very wet season.

It is expected that the area in market garden crops will continue to increase and that other crops such as asparagus will be grown more extensively. Mr. G. Wattie, manager of the Gisborne branch of J. Wattie Cannieries, stated recently: "The company showed its faith in this district by investing a third of a million pounds in the developing of canning. This was not done blindly, as the company realised the potentialities of Gisborne".

Kumaras are grown fairly extensively in the district and thrive well on several soil types and particularly on areas which have been built up by deposits of river silt. Although heavier yields are obtained on some areas, the average is between 5 and 6 tons per acre. Variety trials carried out in the district in 1952 indicated that the New Zealand varieties were heavier yielding than others which were under trial.

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The main planting of potatoes is from mid-June onward for the early market and yields of up to 5 tons per acre are obtained. In Wainui district, which is free of frosts, potatoes are usually planted in April and May and harvested in August and September. Generally no commercial plantings of late potatoes are made, owing to the prevalence of the potato tuber moth and the poor keeping quality of the potatoes produced.

Very early crops of vegetables such as beans, lettuce, and cabbage are produced in frost-free and almost frost-free areas in the district.

Glasshouse tomato production and the growing of crops under cloches are being done only on a small scale, but interest is increasing in these methods.

Sub-tropical Fruits

Outstanding among the sub-tropical fruits which thrive in the district is the avocado. The first trees, four seedlings, were planted in 1922 on the property now owned by Mr. L. Grey, Ormond, and these began fruiting in 1932.

In 1941, 19 trees of the varieties Mexicola, Edranol, Anaheim, Fuerte, Duke, Leucadia, Nabal, Puebla, Benik, and Ryan were imported from California.

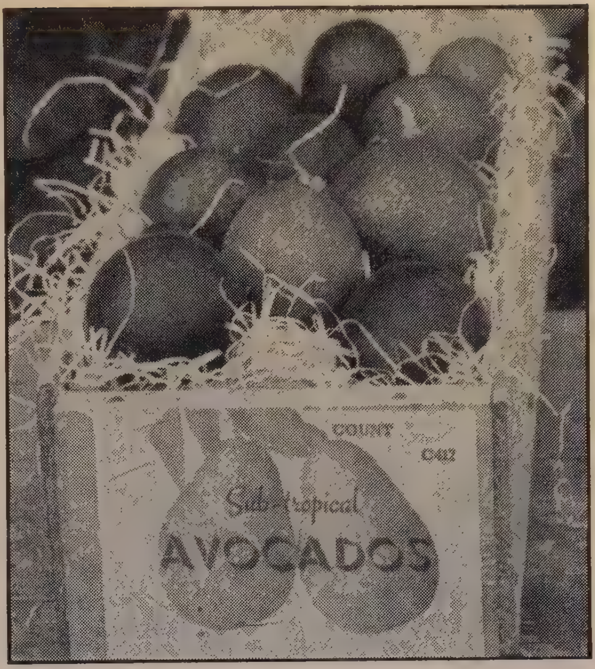
The varieties Mexicola, Fuerte, and Nabal are most promising and one of the original seedlings has also performed well.

In 1951 one of the Nabal trees produced 255 fruits with a total weight of 3cwt. and the successful original seedling tree produced 300 fruits which averaged 1¼lb. each.

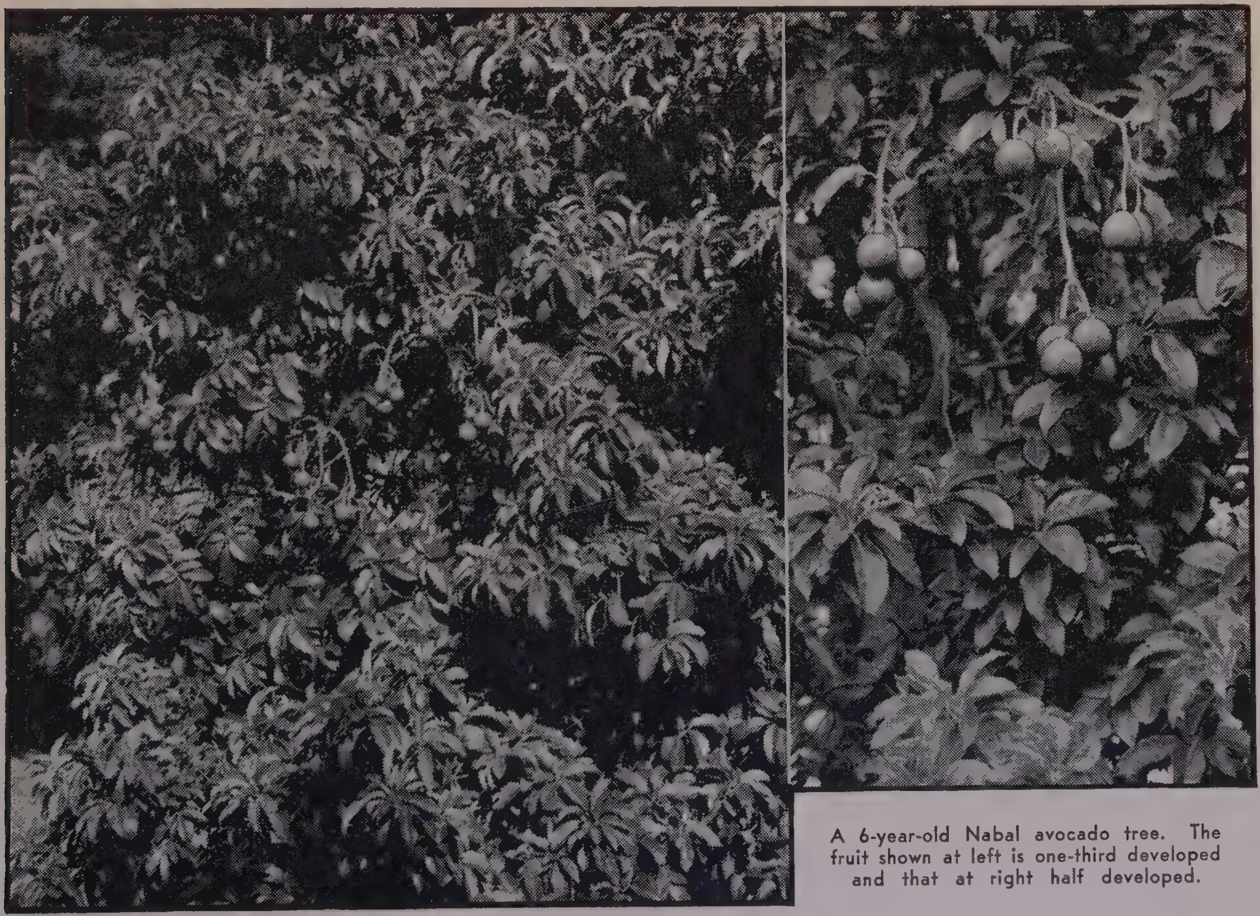
The avocado is extremely popular in America, where it is usually called the alligator pear, and although it is not very well known in New Zealand, it is gaining popularity and the demand exceeds the supply.

Fairly extensive plantings are planned by Mr. Grey, who is importing a further 100 trees, and with these and trees of his own propagation he hopes to establish 350 trees on the property.

Other sub-tropical fruits which thrive in parts of the Gisborne district are feijoas, loquats, persimmons, passion fruit, tree tomatoes, guavas, pawpaws, and cherimoyas.



The avocado is gaining in popularity in New Zealand and the demand exceeds the supply.



A 6-year-old Nabal avocado tree. The fruit shown at left is one-third developed and that at right half developed.

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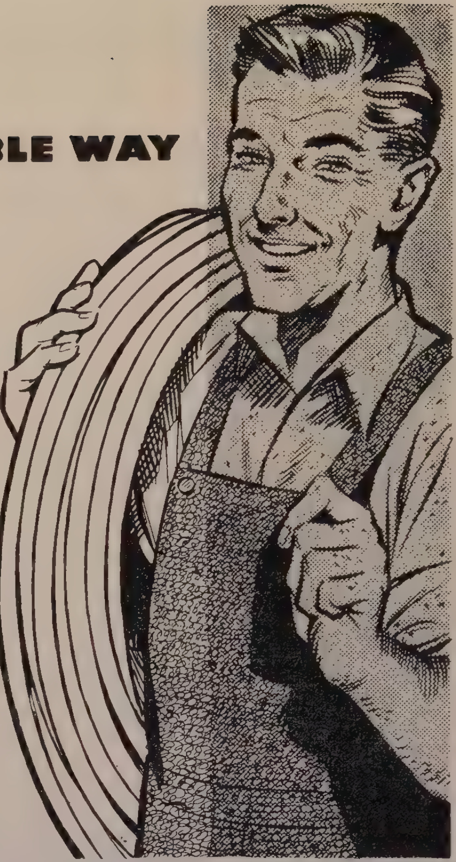

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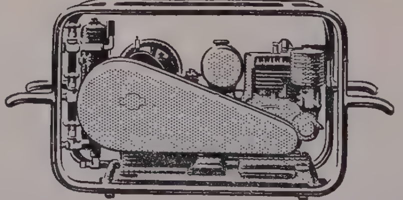

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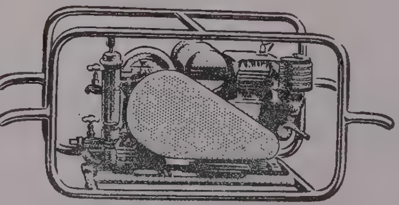

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A 30-year-old avocado tree. In the Gisborne district in 1951 an avocado tree produced 300 fruits which averaged 1¼lb. each.

Banana palms also thrive in the district in some areas, but only one grower has succeeded in ripening a bunch of the fruit.

Pip Fruits

The average annual production of pip fruits for the last 6 years, including 1953, was 37,000 bushels of apples and 4000 bushels of pears. Two of the older orchards in the district were removed this season, but several new orchards planted under the rehabilitation scheme have not yet begun production.

The district is well suited for the production of pip fruits and quality and yields are comparable to those in Hawkes Bay, where up to 1000 bushels per acre are produced in favourable seasons. The production and expected production from new plantings are not sufficient to meet the demand and supplies have to be obtained from Hawkes Bay every season to satisfy the local demand.

Pear production is not sufficient to meet local demand and increased plantings of suitable varieties would appear to be well worth while.

Stone Fruits

In 1953 the estimated production of stone fruits was 9700 bushels of peaches, 1200 bushels of nectarines, and 1150 bushels of plums.

Small increases in plantings during recent years are gradually increasing production, but the demand exceeds the supply and consignments from Hawkes Bay orchards are relied on to meet local requirements.

Peaches and plums mature 7 to 10 days earlier than in other districts, and although increased plantings of early varieties appear to be worth while, other varieties should be planted with caution owing to the proximity of Hawkes Bay orchards and the possibility of oversupply at some periods.

Growth of trees and quality and yields of stone fruits are comparable with those in Hawkes Bay and increased plantings of early varieties suitable for bottling or canning should be considered.

Plantings of Golden Queen peaches for supplies to the canning factory are to be made, and at least 50 acres are required immediately for this purpose.

Grape Production

The district is ideal for the growing of outdoor grapes, of which there are 40 acres under production.

The main variety grown is Albany Surprise, which gives an average yield of 5 tons per acre annually over the district. A 2½-acre vineyard on the foothills at Hexton (6 miles from Gisborne) has yielded up to 20 tons of grapes a year. Vineyards in this area usually mature their fruit 2 weeks earlier than do vineyards on the Gisborne flats, and these are some of the first outdoor grapes on the market in New Zealand.

Over 30,000lb. of outdoor grapes are air-freighted each season to various parts of the Dominion from Gisborne district. There are also many acres of grapes grown for wine making and some table grapes are also used for this.

Citrus Fruits

When the first plantings of citrus were made in the district nothing was known regarding suitable stocks or varieties, and plantings of lemons and oranges were made from any trees which were available, regardless of the stocks used for propagation.

Most of these stocks were rough lemon or citronelle, and disappointing results were obtained with sweet oranges on some properties.

In later years some plantings were made of sweet oranges propagated on *Poncirus trifoliata* and Island sweet orange stocks. These trees are now producing fruit which compares favourably with any imported product.

Indications are that increased plantings of sweet oranges, particularly Washington navel, on sweet orange and *P. trifoliata* stocks are worth while.

Although Wheeny grapefruit does well on most stocks, the quality of this fruit is outstanding when propagated on *P. trifoliata* stocks.

A good proportion of the Meyer lemon crop, which is usually harvested from mid-April onward, is shipped to southern markets, where a ready sale at satisfactory prices is obtained.

The estimated crops of citrus fruits for 1952 and 1953 and the yearly averages for 1947-52 are shown in Table 1. Table 2 shows the ages of citrus trees in the district and also gives an indication of planting trends.

TABLE 1—ESTIMATE OF CITRUS CROPS IN GISBORNE DISTRICT
Production in bushels

	Average 1947-1952	1952	1953
Lemons, Standard ..	4,800	6,000	6,500
Lemons, Meyer ..	700	1,500	1,700
Grapefruit, N.Z. ..	700	1,800	1,800
Grapefruit, Wheeny ..	200	500	500
Grapefruit, other ..	100	100	150
Oranges, sweet	3,200	6,000	6,000
Mandarins	50	50	50
Other citrus	60	60	110

A Noted Horticulturist

A noted horticulturist and a leading figure in arboreal circles, Mr. W. Douglas Cook, resides at Ngatapa, 22 miles inland from Gisborne.

On his 100-acre property trees, shrubs, and flowers from almost every country in the world flourish and some which can be grown only under glass in other countries thrive in the park on this property.

Potential Development

Horticultural development is in its infancy in this district and there is no doubt that within a few years the area of land used for the production of horticultural crops will be increased by thousands of acres.

The district is ideally suited for the production of early market garden crops, and with improved transport facilities and a successful flood control scheme Gisborne may become one of the main producing areas in the Dominion for supplying city markets.

Air freight is playing an important part in the marketing of produce from the district and there is no doubt that in the near future aircraft used solely for the carriage of freight will be operating.

As land becomes available a more specialised and intensive type of farming devoted to horticulture may be expected. With the increase in population and the building of homes and gardens a greater interest is being taken in horticulture throughout the district.

The growing of flowers for city markets and the production of flower and vegetable seeds, citrus fruits, early vegetables, grapes, sub-tropical fruits, pip and stone fruits, and strawberries are certain to increase in the district.

TABLE 2—NUMBER OF CITRUS TREES (IN AGE GROUPS) IN COMMERCIAL ORCHARDS IN GISBORNE DISTRICT IN 1952

	1 to 5 years	6 to 10 years	Over 10 years	Total number
		Lemon		
Eureka	1,913	112	106	2,131
Lisbon	553	69	698	1,320
Meyer	1,718	26	89	1,833
Villafranca	23	—	2	25
Yen Ben	112	—	—	112
Others	8	—	4	12
	4,327	207	899	5,433
		Sweet orange		
Washington navel ..	1,460	358	197	2,015
Valencia	678	186	206	1,070
Navelencia	336	13	105	454
Best's	40	3	51	94
Carter navel ..	27	4	3	34
Groverly navel ..	649	73	44	766
Joppa	3	—	30	33
Lue Gim Gong ..	55	—	9	64
Golden Nugget navel	15	—	23	38
St. Michael ..	84	12	29	125
Ruby Blood ..	1	2	27	30
Others	186	4	30	220
	3,534	655	754	4,943
		Grapefruit		
New Zealand ..	771	66	256	1,093
Wheeny	678	41	7	726
Omi Kin Kan ..	—	1	24	25
Others	37	—	4	41
	1,486	108	291	1,885
		Mandarin		
Kara	17	8	—	25
Satsuma	51	1	—	52
Others	13	—	4	17
	81	9	4	94

The climate and soil make it possible to grow successfully almost any kind of flowers, fruit, and vegetables grown anywhere else in the Dominion.

Acknowledgments

Acknowledgment is made to W. A. Pullar, Soil Bureau, Department of Scientific and Industrial Research, Gisborne, and to the Poverty Bay Catchment Board.

Reference

"The New Zealand Journal of Agriculture", vol. 81, pp. 209-222, A. A. Duncan (1950).

All photographs by Wade.

Gisborne district is well suited for the production of grapes, and in the season over 30,000lb. of grapes are air-freighted from the district to other parts of the country.

Registration of Apiaries

UNDER the Apiary Registration Regulations 1953 Apiary Instructors have been appointed Registrars of Apiaries, and applications for registration and all correspondence should now be addressed to them and not to the Horticulture Division of the Department of Agriculture, Wellington.

Registration is now permanent and there will be no more 5-yearly re-registrations. No registration certificates will be issued, but applications will be acknowledged and apiarists will be advised when registrations have been completed. Notification of changes in hive holdings of 5 or more, previously required in June, are now required in May.

These changes are intended to make registration procedure simpler for the Department and easier for the beekeepers.

Further information may be obtained from Registrars of Apiaries (Apiary Instructors) at Auckland, Hamilton, Tauranga, Hawera, Palmerston North, Hastings, Greymouth, Christchurch, Oamaru, and Invercargill.

Mixed Farming under Irrigation in Mid-Canterbury

IN Canterbury there are about 750,000 acres of shingly soils where pasture production is often unreliable during dry summer periods. This has been the case in Ashburton County, where there are considerable areas of these soils, but in part of the county the problems associated with the dry periods have been overcome by the use of irrigation water from the Ashburton-Lyndhurst Irrigation Scheme, which was completed in 1944. The implications of irrigation on farm management and production are discussed in this article by W. A. McKellar, Fields Instructor, Department of Agriculture, Ashburton, who describes the development under irrigation of a farm in the Winchmore district 6 miles west of Ashburton.

UNDER dryland farming this farm of 460 acres was barely an economic unit. Similar land in the district carried from $\frac{3}{4}$ to $1\frac{1}{2}$ ewes per acre, and to enable these carrying capacities to be maintained considerable areas of forage crops were grown and frequent pasture renewal was necessary.

Dry Farming Management

Pastures

Pastures consisting of perennial ryegrass, cowgrass, and white clover were sown with a cover crop of rape in spring or greenfeed oats in autumn. On unlimed land and with grass-grub attacks the life of pasture was short and renewal was usually necessary in about 3 years.

Cash Crops

To meet the cost of frequent pasture renewal cash crops were grown. These crops in turn lowered the fertility and still further reduced the life of pastures. Cash crops consisted of wheat and oats, which followed either grass or rape. Yields of wheat were usually about 20 to 25 bushels per acre with yields up to 40 bushels per acre in a wet season and down to 15 bushels per acre in a dry season. Approximately 60 acres of wheat were grown each year with 20 acres of Gartons oats, the latter yielding 40 to 50 bushels per acre.

HEADING PHOTOGRAPH: Drilling pasture on border-diked paddock.

Root and Fodder Crops

To overcome the uncertainty of pasture production supplementary crops had to be grown. About 30 acres of rape were sown to fatten lambs, and for winter feed 10 acres of turnips were provided. By 1943-44 insect pests combined with drought conditions made the turnip crop so uncertain that the farmer was changing over to blue lupins. In addition, about 50 to 60 acres of Dun oats were sown after pasture in February, the oats being grazed lightly in April after the rape was finished; the area was then saved for spring feeding.

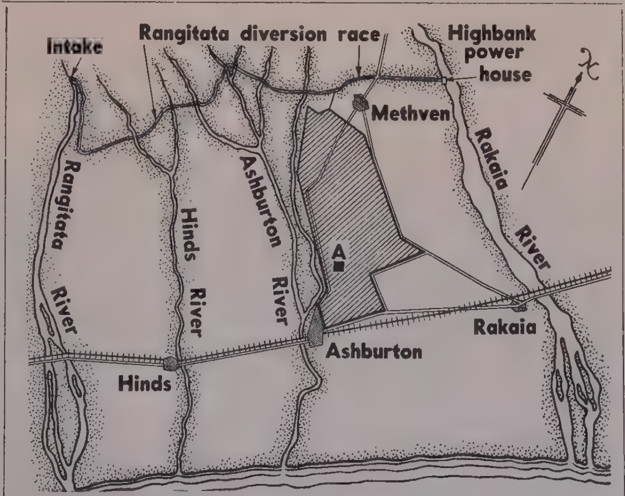
Irrigation Offers a Solution

When irrigation water became available the owner was quick to realise that this offered him a way to increase stock numbers and reduce cash cropping considerably.

The farm, as is general in the district, was well suited to irrigation. An even fall of 6in. per chain enables the distribution of water by gravity cheaply and efficiently. Cost of constructing border dikes has been low and has averaged £3 to £4 per acre, plus £1 per acre for concrete headgates. Additional costs consequent on irrigation have been those for subdivision of the large (up to 100 acres) paddocks which were used under dryland farming. Extra stock races, too, had to be constructed to serve the smaller paddocks and extra stock purchased as carrying capacity was increased. As most of these charges have to be met at the time of laying down new areas, farmers have been careful not to develop too large areas annually and so upset the economy of the farms.

Development for Irrigation

Development since 1945 has been steady, being financed entirely out of income. An average of 25 acres has been border-diked and sown down annually. In addition 52 acres of pasture can be wild-flooded below



Part of Mid-Canterbury, showing the 68,000-acre Ashburton-Lyndhurst Irrigation Scheme (shaded area), including the position of the farm (A) described in the article.

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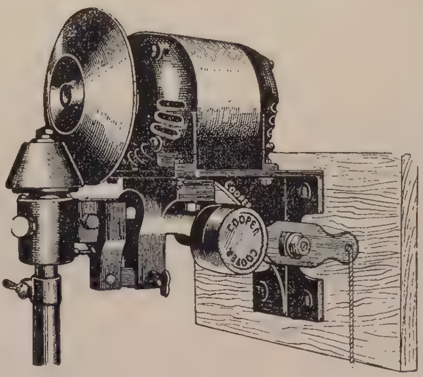

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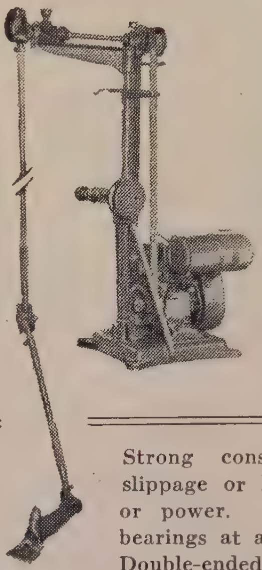

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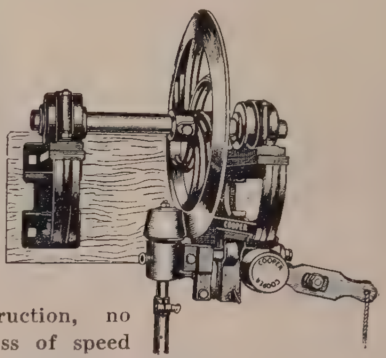

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border-diked pasture, making a total of 215 acres—205 of pasture and 10 of lucerne—now under irrigation. The following table shows yearly development:—

TABLE I—DEVELOPMENT OF IRRIGATION

Season	Area bordered per season	Total area bordered
	acres	acres
1944-45	33	33
1945-46	28	61
1946-47	14	75
1947-48	19	94
1948-49	38	132
1949-50	—	132
1950-51	31	163
1951-52	—	163

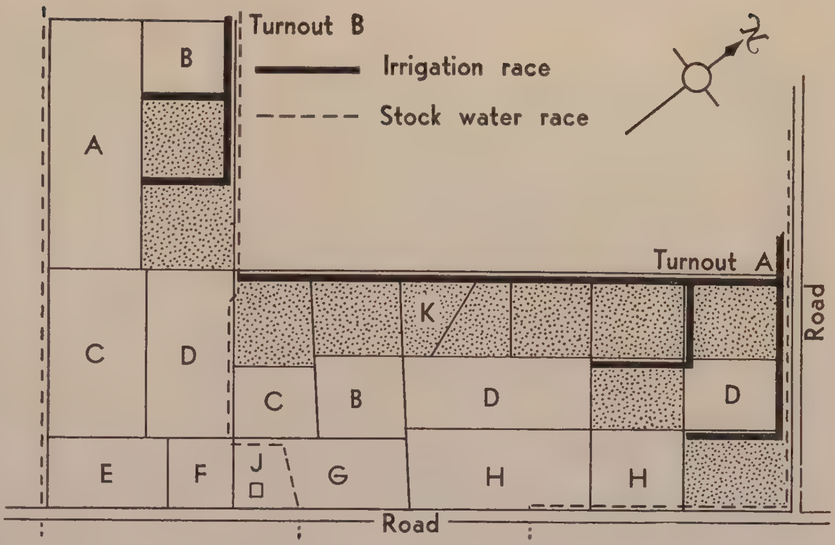
Cost of Water

The quantity of water used has naturally increased as the area prepared for irrigation has been enlarged. It has varied also according to the seasonal rainfall of the district for the October-March period, so that irrigation water plus natural rainfall has given a total of just over 40in. This is shown in Table 2.

The cost of water is 4s. per acre-foot, the contract price for water on the Ashburton - Lyndhurst Irrigation Scheme. Under this contract the farmer pays for 1 acre-foot of water over one half of the irrigable area of the farm. A development period of 5 years is allowed, during which only the quantity of water used is paid for. Extra water used above the contract amount is paid for at the contract rate. Table 2 shows that in 1950-51, a wet season, although only 121 acre-feet of water were used, the contract amount of 138 acre-feet was paid for.

Irrigating Time

Table 2 shows that in a season when maximum irrigation has been carried out each acre irrigated has required about 3 man-hours of irrigation during the season and that about 0.8 acre-foot of water is applied by 1 man in 1 hour. As some irrigation has been carried out without a man in attendance, the man-hours shown in Table 2 are approximate only, but they serve to illustrate that the labour involved in irrigating occupies a considerable amount of time.



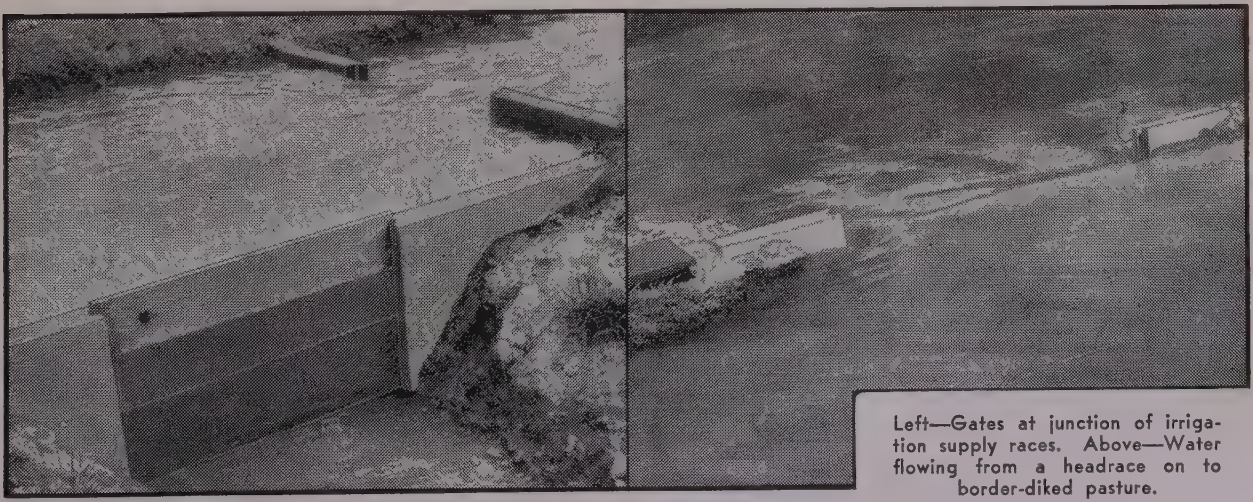
Utilisation of areas on the farm. The shaded areas indicate border-diked irrigated pasture, with the exception of K, which is irrigated lucerne. Other utilisation is: A—Lupins for winter feed. B—Linseed. C—One-year-old pasture. D—Old pasture. E—Rape and young grass. F—Two-year-old pasture. G—Rape. H—Lupins and grass for winter feed. J—Homestead.

Present Position and Management

With approximately half the farm receiving water, watering has become the most important operation and receives priority over all other work. The owner's son does most of the irrigating and prefers this work to the long hours previously spent on the tractor. Watering begins in October, further water being applied at 3-weekly intervals throughout the season. Heavy rain may interrupt the watering programme for a few days, but the owner realises that regular irrigation is necessary if the full benefits of irrigation are to be obtained. This farm, being over 400 acres, is entitled to two turnouts, A and B on the accompanying plan. From turnout A 129 acres of bordered pasture, 52 acres of wild-flooded pasture, and 10 acres of bordered lucerne are irrigated. The 8-cusec flow at the turnout enables 2 acres to be watered per hour. Fifteen hours' irrigation per day on each of the 2 allotted days per

TABLE 2—IRRIGATION WATER USED ON FARM AND TIME SPENT ON IRRIGATING

Season	Bordered area available for watering	Approximate man-hours on irrigation	Rainfall Oct.-March	Irrigation water	Total water Oct.-March	Acre-feet water	Cost of water
	acres		in.	in.	in.		£ s. d.
1945-46 ..	33	89	13.15	27.0	40.15	74	14 16 0
1946-47 ..	75	87	19.47	11.5	30.97	72	14 8 0
1947-48 ..	94	280	12.55	30.2	42.75	232	46 8 0
1948-49 ..	112	317	11.17	28.3	39.47	262	52 8 0
1949-50 ..	132	328	19.74	24.9	44.64	271	54 4 0
1950-51 ..	132	147	27.09	11.1	38.19	121	27 12 0
1951-52 ..	163	480	14.45	29.4	43.85	396	79 4 0



Left—Gates at junction of irrigation supply races. Above—Water flowing from a headrace on to border-diked pasture.

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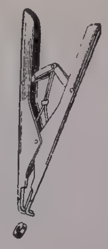

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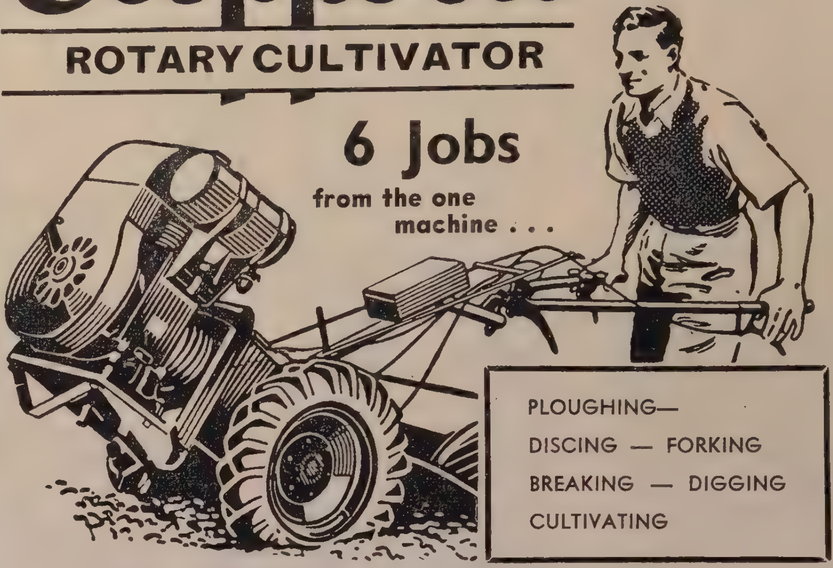

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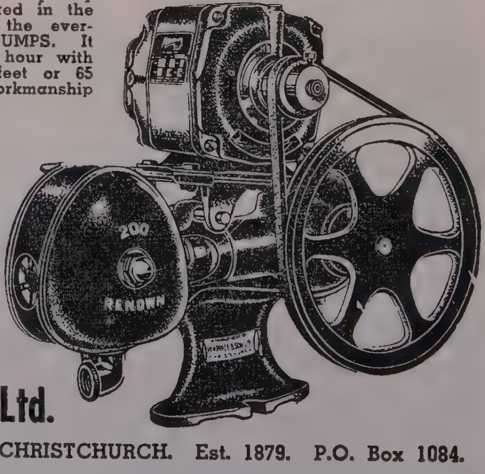


Sheep grazing on border-diked pasture.

week are required to get around the whole area once every 3 weeks.

Pasture Management

It has been found that owing to the aggressive nature of browntop on this country pastures establish well when sown on a fallow following rape or greenfeed lupins. One ton of lime is applied following the border-diking and the pasture is broadcast with 1½cwt. of superphosphate. A grazing mixture is sown of 20lb. of Certified perennial ryegrass, 4lb. of Certified cocksfoot, 2lb. of dogstail, 2lb. of Certified white clover, and 2lb. of Certified Montgomery red clover. Timothy has been tried, but it will not stand continuous close grazing by sheep. It is more suitable for cattle pastures. As the farmer does not possess his own header, the simple ryegrass-white clover mixture for seed production has not been used.

To maintain the irrigated pastures in a vigorous state 1½cwt. of superphosphate is applied annually in the early spring and a second ton of lime when the pastures are 2 years old.

The dryland pastures on the farm are now receiving similar liming and manurial treatment and are lasting longer, owing largely to stock being concentrated on irrigated pastures with consequent lenient grazing of the dry pastures in drought periods.

The irrigated pastures vary in age from 2 to 8 years. The older ones are thriving and appear to be increasing in vigour and density under the heavy stocking. The balance between grasses and clovers is good and the resultant denser turf has now a better water-holding capacity than formerly with a more lasting effect from each application of irrigation water.

The growth of pastures under irrigation calls for efficient utilisation if the full benefits of irrigation are to be obtained. Until now the owner has depended on the small area of lucerne to provide hay for winter feed. The main shortage period, which used to be the dry summer, is now winter. During the development period increased production of winter forage crops has been useful as preparation for new pasture.

Some of the management changes following irrigation can be seen from the land utilisation figures. Before irrigation there were 244 acres of pasture of which approximately 20 acres were set aside for pasture seed production, whereas today there are 293 acres in pasture, of which 205 acres are irrigable. In addition there are 10 acres of lucerne which can be irrigated. Cereal crops used to occupy about 80 acres per annum; now no cereal crops are grown. Summer and winter supplementary crops still take up between 100 and 120 acres, but these crops now comprise rape and bitter blue lupins. Before irrigation turnips, greenfeed oats, and rape were grown.

Livestock

The extent to which carrying capacity has been increased is indicated by the fact that 1028 ewes went to the ram last autumn compared with 620 in 1943-44. In addition 279 ewe hoggets were wintered, whereas in 1943-44 ewe replacements were bought. With 95 dry sheep wintered and 10 cattle, the farm is now carrying just on 3 ewe equivalents per acre compared with less than 1½ before irrigation. Lambing percentages and wool weights are still increasing.

A bare high spot which has not received irrigation water.

Baled lucerne hay on a border-diked paddock.

In 1943-44 the lambing percentage was 102 and in 1952-53 it was 109; during the same period the average fleece weight increased from 8lb. to 9½lb.

Increase in Lamb Meat

Fat lamb weights on the other hand, as is general when fattening is done mainly on irrigated grass, are lower with the higher carrying capacity. The more important factor, however, lamb meat produced per acre, has increased from 49 to 78lb. The 33lb. average for fat lambs in the 1951-52 season may be lower than normal, as the season was difficult generally for lamb fattening throughout the county.

The ewes are fine three-quarter breds, of which the best 300 are mated with Romney rams to provide replacements. The remainder are mated with Southdown or Southdown-Border cross rams after flushing on irrigated pasture. The ewes are wintered on bitter blue lupins, hay, saved pasture, and Italian ryegrass greenfeed.

One draft of fat lambs is taken off the mothers before Christmas and a second in mid-January (15 to 20 per cent. in all), when the remainder are weaned on to irrigated pasture with daily access to rape. Further drafts of fat lambs are taken at 3-weekly intervals.

Only normal losses from deaths both of ewes and of lambs have been experienced. Foot-rot has not proved to be a serious problem. Very little drenching is done.

Future Development

Within the period of 8 years since the bordering of the first paddock carrying capacity has been approximately doubled, net returns have been greatly increased, and a unit that was barely economic and was becoming progressively more depleted is now a thriving farm, supporting, beside the owner, his married son, for whom a house has been built on the property.

Full development has not yet been reached. With the saving of more hay, the making of silage, the carrying of more cattle to control surplus spring growth, and more extensive use of winter-saved grass, production can be still further increased. No irrigated pastures have yet been broken up. Fertility must, however, be increasing under the heavy stocking, and still more productive pastures will be obtained the second time round. Nevertheless, in 1951-52 the farm produced some 7000lb. more wool and some 13,000lb. more lamb meat than it did before irrigation. The only item which has ceased to figure in the returns is wheat, some 900 bushels of which were produced in 1943-44. However, the farm is in much better order for wheat growing than it was then, and should it be necessary to return to wheat growing, yields will be considerably greater than they were under dryland farming.

Grading Points for Export Butter and Cheese

BUTTER-MANUFACTURING companies which obtained an average grade of 93.75 points or more and cheese-manufacturing companies which obtained an average grade of 92.50 points or more during the year ended 31 July 1953 are listed below in order of merit. Of the total listed, 26 butter and 12 cheese factories are in the North Island and 2 butter and 12 cheese factories are in the South Island. Production figures are for the balance-sheet year 1952-53, and the figures of quantities graded for export are for the period 1 August 1952 to 31 July 1953.

Creamery Butter

Company	Registered number	Brand	Production tons	Graded for export tons	Average grade points	Grading port
Westland	145	Westland	726	523	94.337	Lyttelton
United	1296	Whariti	587	160	94.321	Wellington
Kaikoura	302	Kai	614	474	94.250	Lyttelton
Te Aroha-Thames Valley	344	Overseas	3860	3199	94.240	Auckland
Raetihi	717	Raetihi	362	238	94.205	Castlecliff
Wairoa	1345	Wairoa	645	147	94.111	Hastings
Cheltenham	3	Pakeha	1888	943	94.088	Wellington
Cambridge (Hautapu)	1239	Cambridge	2877	1973	94.080	Auckland
Collingwood	1254	Golden Hills	473	240	94.060	Wellington
Wangaehu	1326	Wangaehu	664	483	94.057	Castlecliff
Kuku-Manakau	905	Ohau	561	343	94.036	Wellington
Taihape	1188	Tikapu	262	125	93.996	Castlecliff
Konini	1203	Konini	1623	929	93.988	Wellington
N.Z. Dairy (Frankton)	1510	Anchor	5826	3035	93.970	Auckland
Awahuri	664	Red Rose	1405	629	93.930	Wellington
Masterton	1307	Masterton	871	584	93.901	Wellington
N.Z. Dairy (Morrinsville)	415	Anchor	4192	4186	93.855	Auckland
Okitu	1270	Okitu	175	104	93.841	Gisborne
Rangitikei	1360	Rangitikei	1011	641	93.833	Castlecliff
Moa Farmers'	341	Inglewood	2171	1697	93.815	New Plymouth
Rongotea	8	Rongotea	1375	798	93.812	Wellington
N.Z. Dairy (Tirau)	95	Anchor	4215	4215	93.802	Auckland
Morrinsville	330	Lockerbie	5078	4867	93.800	Auckland
Te Awamutu	397	Lotus	2527	2237	93.797	Auckland
N.Z. Dairy (Mt. Eden)	378	Anchor	3916	983	93.790	Auckland
Ruawai	66	Ruawai	2477	2445	93.786	Auckland
N.Z. Dairy (Tuakau)	1320	Anchor	4160	3949	93.778	Auckland
Mangorei	345	Mangorei	1293	1129	93.752	New Plymouth

Butter companies whose butter was graded mainly for the local market and for which an average grade of 93.75 points or more was obtained for the combined local and export gradings were as follows:—

Company	Registered number	Brand	Production tons	Graded tons	Average grade points	Grading port
Rangiwahia-Ruahine	750	Quail	186	63	94.015	Wellington
Karamea	1570	Karamea	391	305	93.970	Lyttelton
Inter-Wanganui	6	Inter-Wanganui	396	232	93.953	Lyttelton
Golden Bay	146	Sovereign	958	892	93.941	Lyttelton
Murchison	1888	Airship	453	340	93.905	Lyttelton

Cheese

Company	Registered number	Brand	Production tons	Graded for export tons	Average grade points	Grading port
Wright's Bush	206	Wright's Bush	255	258	93.002	Bluff
Drummond	1823	Drummond	68	67	92.912	Bluff
Momona	1010	Momona	414	398	92.904	Dunedin
Dalefield	9	Dalefield	1272	1215	92.749	Wellington
Belvedere	486	Belvedere	562	561	92.703	Wellington
T. L. Joll (Taikatu)	1723	Maori Chief	529	525	92.683	Patea
Glenham	1484	Glenham	176	179	92.668	Bluff
Awarua	545	Awarua	450	453	92.636	Bluff
Riverbank	985	Riverbank	609	596	92.622	Wellington
Mataura	38	Mataura	475	480	92.599	Bluff
Mokotua	67	Mokotua	236	238	92.590	Bluff
Featherston	360	Featherston	1725	1631	92.587	Wellington
Tisbury	701	Tisbury	222	221	92.585	Bluff
Thornbury	1581	Thornbury	318	324	92.584	Bluff
Parkvale	1240	Parkvale	445	444	92.581	Wellington
Morton Mains	1604	Morton Mains	168	169	92.570	Bluff
Aparima	188	Aparima	370	373	92.561	Bluff
Takamatua	33	Takamatua	137	134	92.548	Lyttelton
Kaupokonui (Oeo)	1132	Kaupokonui	740	740	92.542	Patea
Mells	764	Mells	637	629	92.529	Patea
Tararua	444	Tararua	368	365	92.527	Wellington
Alton	1890	Alton	917	915	92.525	Patea
Greytown-Wairarapa	529	Greytown	959	858	92.508	Wellington
Kiritaki	1521	Premier	485	482	92.504	Wellington

Molybdenum and its Use in Grassland Production

IT is well known that plants require for their healthy growth not only the well-known trio nitrogen, phosphorus, and potassium and the less appreciated magnesium and sulphur, but also traces of certain other elements, namely, in order of their recognition, iron, manganese, zinc, boron, copper, and molybdenum. Molybdenum, the latest element to be proved essential, has come into prominence in New Zealand because of the astounding responses brought about by seemingly trifling applications. In this article E. B. Davies and J. L. Grigg, of the Department of Agriculture's Soil Research Station, Rukuhia, describe responses in trials with molybdenum and give details of some of the soil types in different areas which through trials have been found to be deficient in this element.

MOLYBDENUM is a silver-grey metal of the chromium group, occurring naturally as the di-sulphide molybdenite. In New Zealand this mineral has been reported in a number of places, mainly in west Nelson, and was mined to a small extent at Mt. Radiant, Karamea, about 1917. World production of molybdenum is about 20,000 tons a year, the bulk of it from Colorado and New Mexico. The main consumption is in the manufacture of heat-resistant steel alloys.

Need of Molybdenum for Plant Growth

The need for molybdenum by living organisms, first microbes and later higher plants grown in water cultures, was shown as a result of laboratory research dating from 1930. The first finding was that the soil microbe azotobacter could not fix atmospheric nitrogen in the absence of molybdenum. A field deficiency was not discovered until 1941, Anderson in South Australia obtaining startling subterranean clover responses from sodium molybdate applications. This did not happen naturally. Anderson's finding was the result of investigations by a team of workers dating from 1936, the initial observation being that in a certain area clovers remained vigorous only where trees had been burnt on the ground. The factor responsible was eventually found to be the traces of molybdenum in the ash.

In New Zealand the first hint of a molybdenum deficiency was the discovery in 1944-45, again as the result of intensive laboratory and field work, that the disease whiptail of cauliflowers, which is widespread in New Zealand, was due to molybdenum deficiency and could be rapidly controlled by applications of sodium or ammonium molybdate. Since then responses of a range of pasture, crop, and vegetable species have been demonstrated in the field in New Zealand and Australia and in water and sand cultures in England and America.

Functions of Molybdenum

Two effects of molybdenum in plant growth are established:—

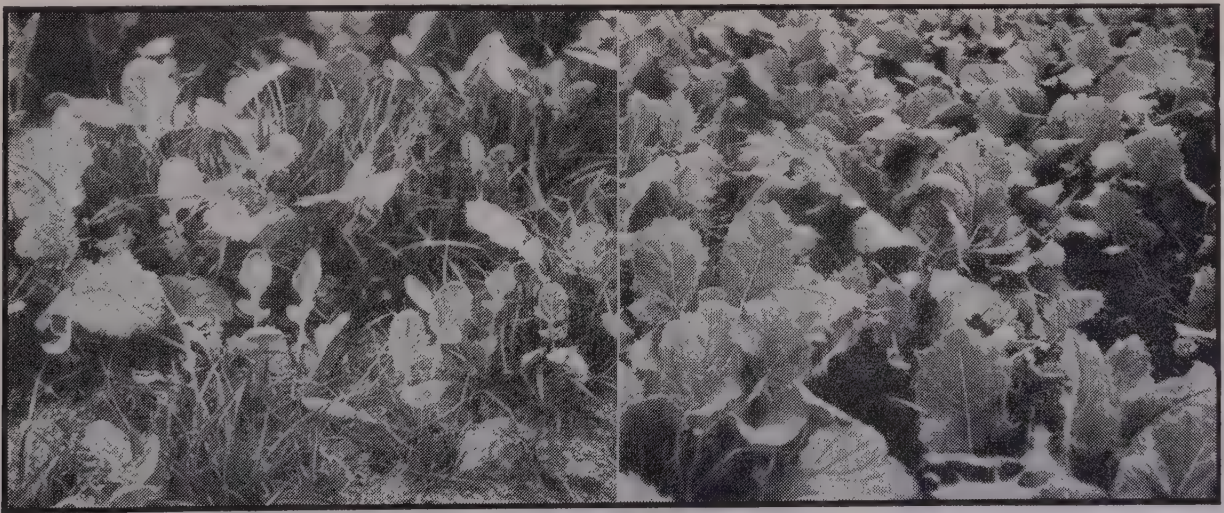
First, it plays an essential part in nitrogen metabolism of all plants. Nitrate nitrogen taken up from the soil cannot be reduced as a step toward protein synthesis without the presence of traces of molybdenum.

In farming practice this effect of molybdenum deficiency can be devastating, as is well shown in the illustration below. The flourishing rape and soft turnips received 3oz. of sodium molybdate per acre. Where molybdenum was not applied the dwarfed, chlorotic plants are barely surviving. A fact that could possibly have repercussions on human health is that associated with this hold-up in the use of nitrate nitrogen there is a greatly lowered content of ascorbic acid, vitamin C. Green vegetables are likely to be affected in molybdenum-deficient areas.

The second function of molybdenum is in the process of fixation of atmospheric nitrogen by soil organisms, both free living and those associated with legumes. Without molybdenum, nitrogen fixation cannot take place. The upper illustration on page 563 shows the remarkable effect of applications of sodium molybdate to a clover field in a molybdenum-deficient region. The dense clover growth in the treated area contrasts with the clover-deficient untreated sward. These two functions of molybdenum will be dealt with in more detail.

As was mentioned earlier, the effect on the cauliflower of the hold-up in the utilisation of nitrate by the plant gave the first clue to molybdenum deficiency in New Zealand. The symptoms in this plant are well defined. In the seedling, leaves are yellowish green, mottled between the veins, and frequently rolled in at the edges (see lower left illustration on page 563). Later, plants may assume the form which has given the name "whiptail" to the complaint, or leaves may become very quilted in appearance (see lower right illustration on page 563). Other members of the brassica family are affected somewhat similarly. Young rape shows the typical cupping of the leaves, accompanied by extreme stunting.

An oat crop in the South Island showed the effect of molybdenum deficiency in a pale green colour and reduced growth of blades. A molybdenum-treated crop had about 12in. advantage in height on the untreated one. Marked responses of



Left—A mixed crop of rape and soft turnips growing in molybdenum-deficient soil. The rape is showing typical symptoms of molybdenum deficiency in its stunted growth and deeply cupped leaves. Right—This photograph was taken in the same paddock as was that at left, but the crop here has received a dressing of sodium molybdate.

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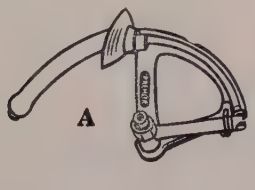

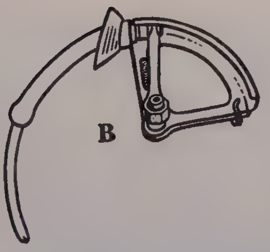

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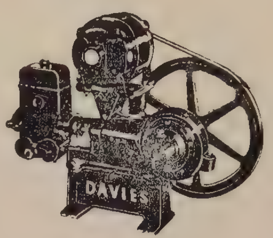

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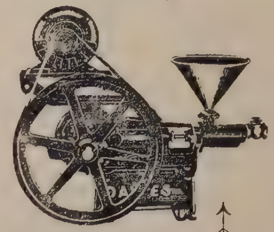

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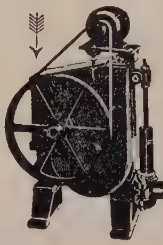

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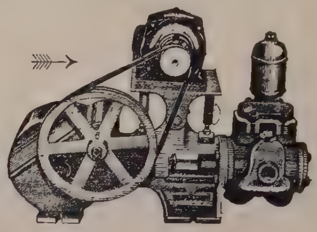

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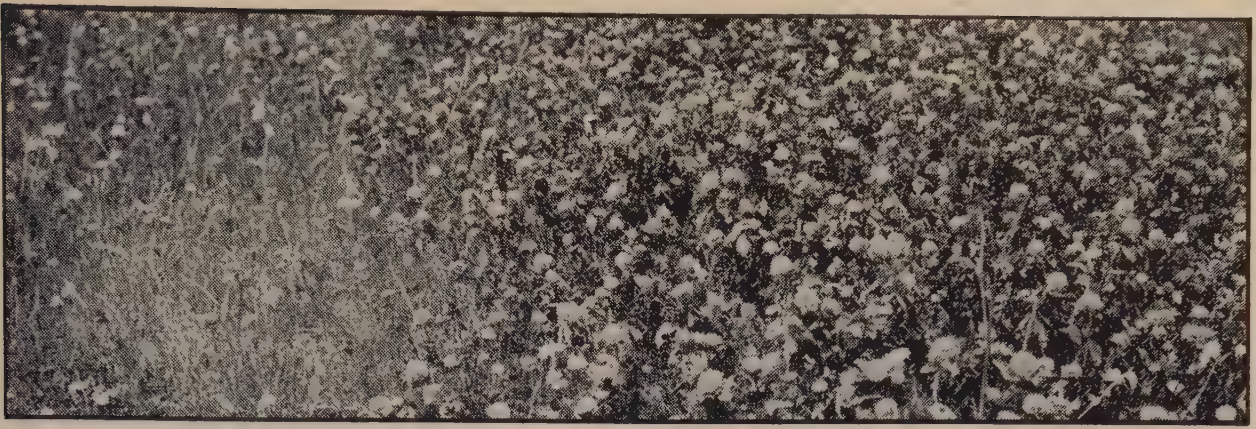


[*Robertson*

The remarkable effect of applications of sodium molybdate to a clover field in a molybdenum-deficient region is shown by comparison of the dense clover growth in the treated area at right with the clover-deficient sward at left.

grass also have been reported. Molybdenum application increases the palatability of grass. It has been noted in many trials that the first indication of a response, well before clovers have started to develop, is preferential grazing. Plots may be clearly defined by an absence of browntop heads.

Clovers have been shown to need molybdenum in very small amounts. The nitrogen-fixing bacteria associated with clover root nodules need somewhat larger amounts. For maximum clover growth these larger amounts of molybdenum are required to ensure an adequate nitrogen supply to the plant.

Nitrogen Fixation

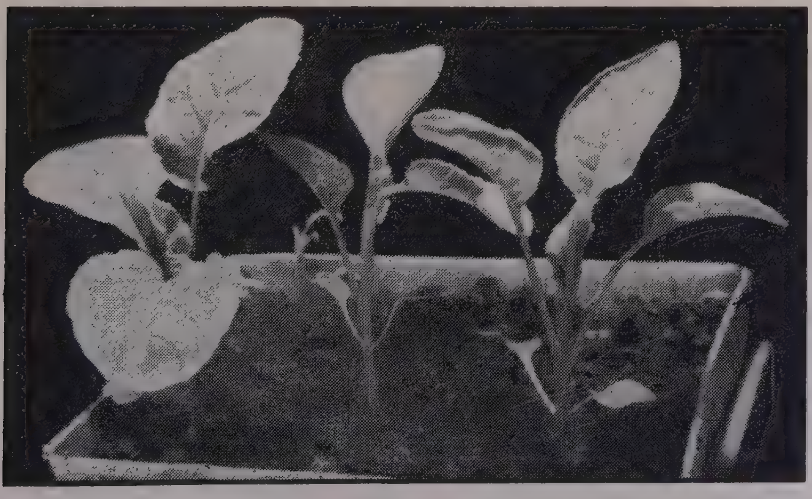
Of elements taken up from the soil nitrogen is required in greatest amount. At the recent farmers' meeting to discuss nitrogen, held at Ruakura, Dr. J. Melville, Director of Grasslands Division, Department of Scientific and Industrial Research, made it abundantly plain that New Zealand grasslands depend for their nitrogen supply on the clover constituent of the sward, the clovers securing nitrogen from the air through the nodule organisms. A further example of the nitrogen-fixing properties of legumes is provided in the fact that though the annual nitrogen removal from a lucerne field as hay may amount to the equivalent of over ½ ton of ammonium sulphate per acre, this removal can be continued year after year without the return of nitrogen by stock or fertiliser. Again it is the nitrogen-fixing organisms, the rhizobia, which are responsible for the supply. However, they cannot work without available molybdenum. All legumes will be affected by molybdenum deficiency, but large-seeded ones such as peas and lupins may have sufficient in the seed for their total requirements, provided the seed does not come from a deficient area.

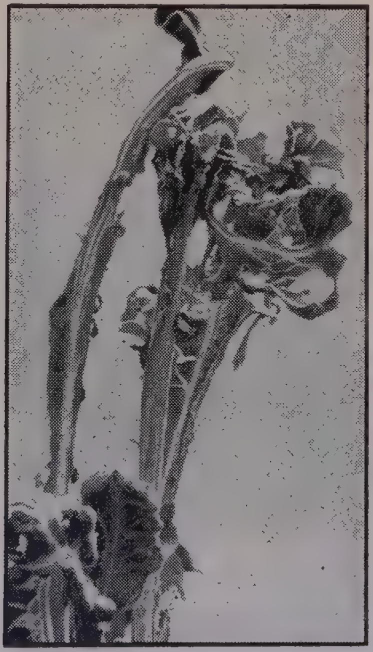
Extent of Molybdenum Deficiency

The identification of whiptail as a molybdenum deficiency suggests the use of the cauliflower as an indicator plant, but it has been found unsuitable, requiring more molybdenum than other species. Moreover, very similar symptoms are brought about by manganese toxicity. Molybdenum-deficient areas have been defined through widespread use of simple observational topdressing trials, mainly on pasture, and through the application of a soil test for available molybdenum. To some extent deficiencies have been associated with certain rocks from which soils have been derived, and this has permitted the extension of proven deficient areas to boundaries based on soil survey data.

In the map on page 565 are shown the sites of molybdenum trials, mainly of the observational topdressing type, on pastures and lucerne. Those showing a positive response are differentiated. However, the illustration does not give a true idea of the spread of molybdenum deficiency, for two reasons:—

1. Whether a response to molybdenum application is obtained or not depends to no small extent on the reaction (pH) of the soil. Hence lack of response may merely reflect liming history and not the inherent molybdenum status of the soil.





Above—Molybdenum deficiency in cauliflower seedlings. Note the cupping in of leaf edges and the paleness between veins. At right—Whiptail in cauliflower.

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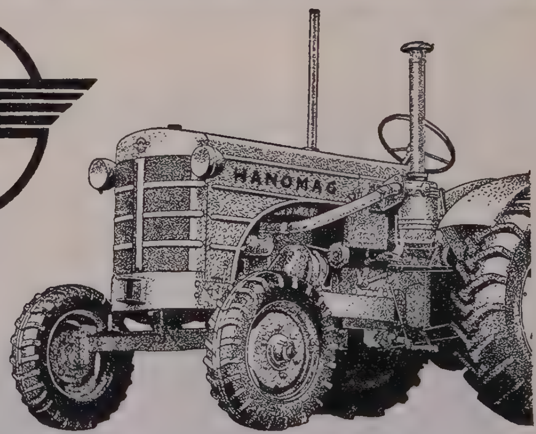

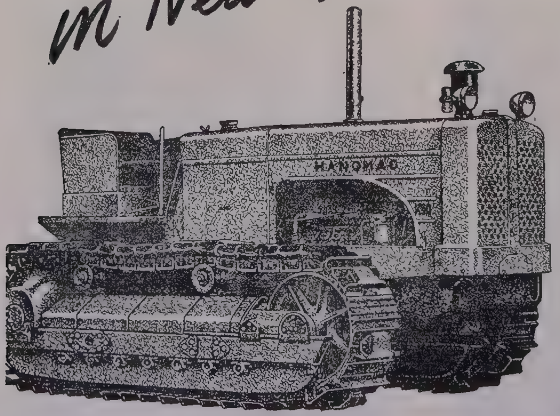

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2. It has recently become evident that trials subjected to set stocking do not, except in cases of acute deficiency, show up responses. If portions of the plots are protected by small frames, a different picture is often obtained. A case is reported where a four-fold increase in yield obtained under frames was not evident without that protection.

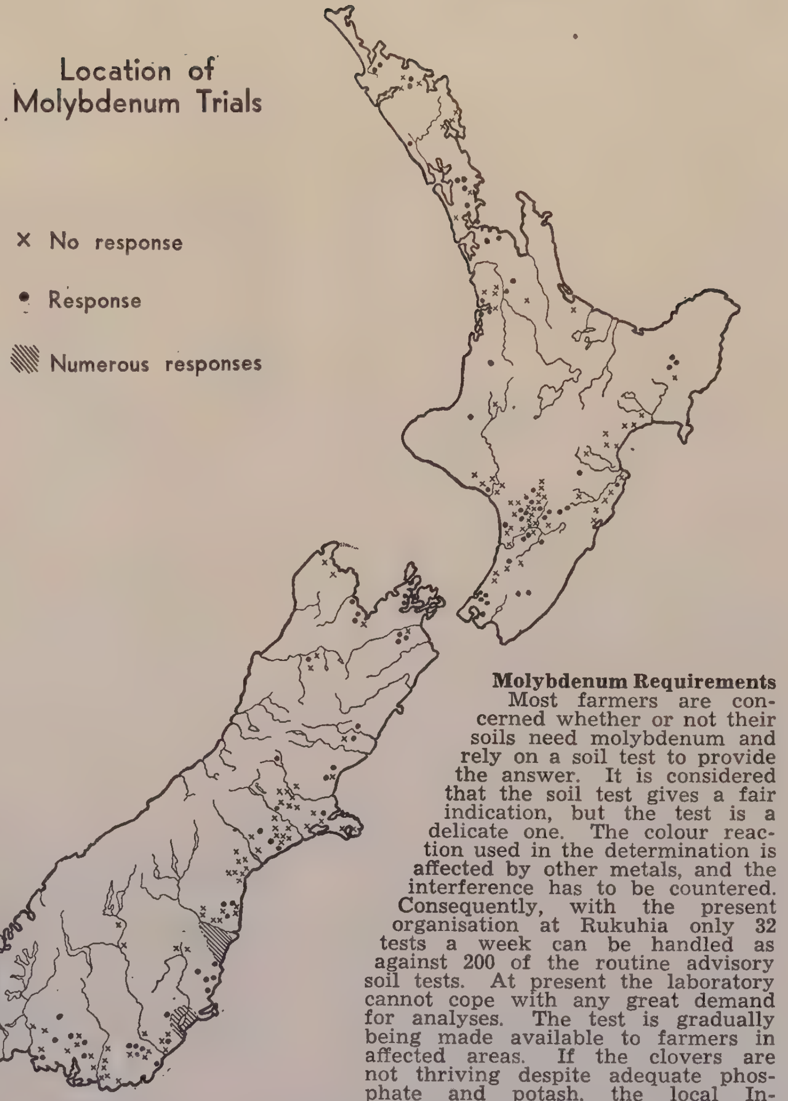
The first reason applies to many trials in Southland and Canterbury.

Broadly, it is considered that many soils derived from greywacke and greywacke alluvium in Southland, Otago, Canterbury, and Marlborough and in portions of Nelson and Westland may prove to be low in available molybdenum. In the North Island responses are very scattered. Again, some responses have been recorded on soils derived from greywacke which extend along the Rimutaka, Tararua, and Ruahine ranges and on isolated areas as far north as the Bay of Islands. In addition, a number of sandstone-derived soils, notably immediately south of Auckland and in Northland, are molybdenum deficient.

In Auckland Province responses have been obtained near Raglan, a possible one north of Morrinsville, and quite a marked one on the flank of a hill near Taupiri—again a greywacke-derived soil. A trial on Manurewa silt loam, a soil south of Auckland, has developed a much improved pasture cover from applications of sodium molybdate. North of Auckland responses (one outstanding) have been obtained on soils of the Puhoi suite in the neighbourhood of Warkworth, and a slight response has been obtained on an ironstone soil (Okaihau gravelly friable clay) near Waipapa, the first pasture response to molybdenum to be demonstrated in New Zealand.

In 1946 the Soil Bureau, Department of Scientific and Industrial Research, obtained responses to molybdenum in pot experiments with Te Kopuru sand. Field trials at the Department of Agriculture's Dargaville Demonstration Farm on Te Kopuru sand have shown molybdenum responses. It is possible that Te Kopuru sand up the length of the North Auckland peninsula may be affected.

Soil analyses suggest that molybdenum deficiency may be fairly widespread in Northland.



Points on Molybdenum Use

A few points concerning the use of molybdenum are dealt with here.

Need for Lime

The question arises as to whether molybdenum application removes the need for lime. Liming benefits the land in a large number of ways such as the provision of the element calcium, a certain amount of which is essential, not only to plant life in general but also to the nitrogen-fixing organisms. It has a considerable number of indirect effects, one of which is to make molybdenum more available. Where this is the only beneficial effect of liming, molybdenum applications prove a substitute and certainly remove the need for the very heavy liming required in many cases to overcome molybdenum deficiency. Pot experiments showed well that molybdenum is not a substitute where lime is needed for another purpose, for example, the countering of manganese toxicity. In the soil concerned subterranean clover practically failed without lime, despite a basal dressing of 5oz. of sodium molybdate per acre. Liming at ½ ton per acre resulted in a ten-fold increase in yield.

The Soil Test

Results of the soil test at the Rukuhia Research Station need to be considered in conjunction with the pH of the soil. In field trials it has been found that when the pH is as high as 6.5 (that is, the soil is nearly neutral) a molybdenum figure of 0.05 part per 1,000,000 seems adequate. If the pH is as low as 5, strongly acid for a soil, the molybdenum response level is more like 0.20 p.p.m. This fits in with the observation that a molybdenum deficiency may be corrected by application of lime (1 to 3 tons per acre according to circumstances) or by application of sodium molybdate—the usual molybdenum carrier. The relationship is shown in the lower diagram on page 567.

Molybdenum Requirements

Most farmers are concerned whether or not their soils need molybdenum and rely on a soil test to provide the answer. It is considered that the soil test gives a fair indication, but the test is a delicate one. The colour reaction used in the determination is affected by other metals, and the interference has to be countered. Consequently, with the present organisation at Rukuhia only 32 tests a week can be handled as against 200 of the routine advisory soil tests. At present the laboratory cannot cope with any great demand for analyses. The test is gradually being made available to farmers in affected areas. If the clovers are not thriving despite adequate phosphate and potash, the local Instructor in Agriculture should be consulted. He will know if the soil types are prone to molybdenum deficiency. Farmers can easily lay down a molybdenum strip for their own information by the following method: Take ¼ teaspoon of sodium molybdate, dissolve it in a 2-gallon can of water, and sprinkle the water over a pegged half-chain square; a knapsack sprayer may be used. If the field is under set stocking, the plot and a control surround should be protected from grazing. Any roughage should be cleared off. Clovers should be checked for evidence of response. The local Instructor's co-operation should be sought for judging results.

Rates of Application

Amounts as small as 1/16oz. per acre of sodium molybdate have given perceptible results, and in one trial ⅛oz. was as effective as 2½oz. Even minute traces have produced effects. Nevertheless some evidence suggests the higher amount, 2½oz., as desirable in some cases. The rate is intentionally kept low, as if the molybdenum content of the herbage, normally about 1 p.p.m., rises above about 10 p.p.m., stock trouble may ensue. This

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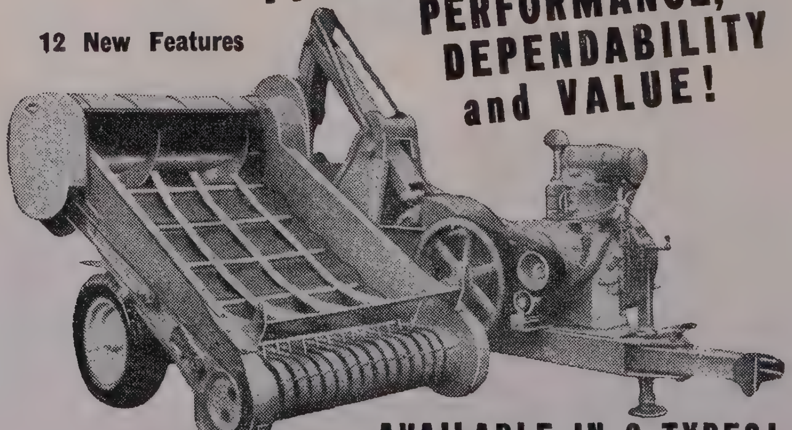

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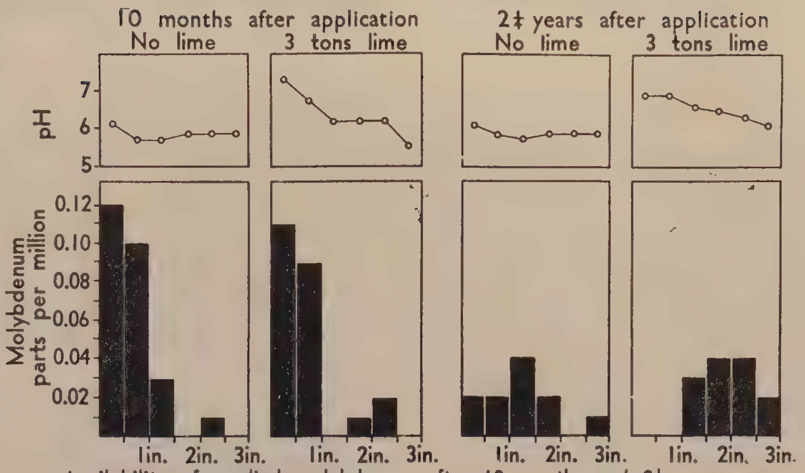
is particularly the case if the copper content of the pasture is below normal. The molybdenum level in pasture varies with pH, phosphate supply, and pasture species. Work of I. J. Cunningham, Superintendent, Department of Agriculture's Animal Research Station, Wallaceville, has shown on peat a seasonal fluctuation, with maximum uptake in spring. In the writers' experience, on no occasion has the 2½oz. per acre rate caused a herbage increase of any moment. An application of 2½lb. per acre in an early trial did.

The results of a molybdenum trial at Waipapa in 1945 are given here:—

DRY MATTER OF PASTURE HERBAGE

Treatment	Yields in gm. per plot	Mo content p.p.m.
Control	460	0.7
Sodium molybdate at 2½lb. per acre ..	550	13.6
Carbonate of lime at 2 tons per acre	506	1.1
Sodium molybdate and carbonate of lime ..	615	14.1

I. J. Cunningham and K. G. Hogan, Technical Officer, on an acid peat at Waitakaruru, found that the level of molybdenum in herbage, normally about 3 p.p.m., was as high as 27 p.p.m. 11 months after an application of 5oz. of ammonium molybdate per acre.



Availability of applied molybdenum after 10 months and 2¼ years.

Present advice is: Do not use molybdenum on peat, and on copper-deficient areas apply it only in conjunction with 5lb. of copper sulphate per acre. Do not exceed 2½oz. per acre of sodium molybdate. The commercial product is in general over 90 per cent. pure and no adjustment of amount for purity is called for.

The small amount is readily applied mixed with superphosphate. Commercial molybdenised superphosphate manufactured in the North Island contains 1lb. of sodium molybdate per ton and that in the South Island contains 2lb. per ton. An application of 2½oz. per acre of sodium molybdate would therefore be obtained by applying 3cwt. and 1½cwt. per acre of molybdenised superphosphate in the North Island and South Island respectively.

In Otago sodium molybdate has been applied in solution with low-volume sprayers.

Frequency of Application

The effect of molybdate applications persists for at least a year and probably much longer. For example, a trial laid down at Herbert in November 1951 is still showing a five-fold increase in herbage yield above the control. However, over a period change of the available molybdenum is clearly shown in an examination of consecutive ½in. soil samples taken on two occasions from a trial at Invermay (see diagram above).

Ten months after application: Of 1oz. of molybdenum applied as molybdate, half could be accounted for by determination of available molybdenum in the top 3in. of soil examined. Of this ½oz., all but 1/10 was retained in the surface inch of the soil. Liming at 3 tons per acre did not cause any downward movement.

Two years and two months after application: At this sampling control plots had increased in available molybdenum, an instance most probably of the rather erratic seasonal changes noted elsewhere. When the difference between control and molybdenum-treated plots was being taken, only 0.2oz. of the molybdenum could be accounted for and this was distributed in the surface 2in. In the lime (3 tons) plus molybdenum plots, the molybdenum had moved an inch deeper, the bulk lying at 1½in. to 2½in. The effect of molybdenum on growth is now noticeable only in the absence of lime. The losses of available molybdenum could be partly accounted for in pasture removal, but mainly, perhaps, by a reversion to a less available form.

On present evidence molybdenum should not be applied more frequently than every second or even every third year. It is necessary to avoid possible undesirable effects through accumulation. Persistence on other soil types will be studied.

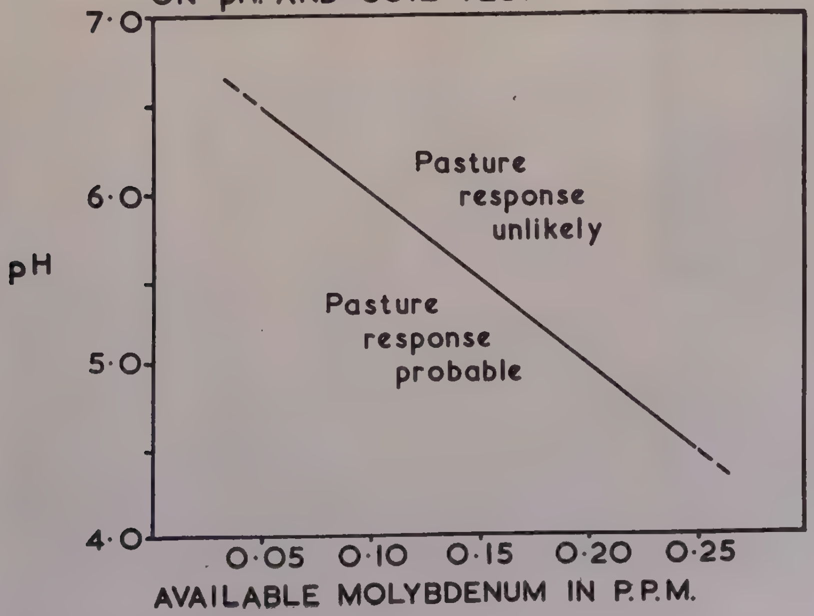
Possibilities

The use of molybdenum has changed considerable areas of third-class land into first-class land in Waitaki County. On a conservative basis the potential increase in production has been valued at £500,000 per annum. Not many parts of New Zealand are likely to prove as deficient in molybdenum. It is not improbable, however, that the carrying capacity of the great area of soils derived from the greywacke spine of New Zealand may be substantially increased with the use of molybdenum. Aerial topdressing with molybdenised superphosphate may make possible the introduction of clovers into large areas of hill country. This latest addition to the family of trace elements shows promise, and with opportunity and proper guidance its use should have good results.

Acknowledgment

The authors are indebted to W. R. Lobb, Instructor in Agriculture, Department of Agriculture, Oamaru, for useful information and to the staff at Invermay Research Station for supplying soil samples from the lime-molybdenum trial.

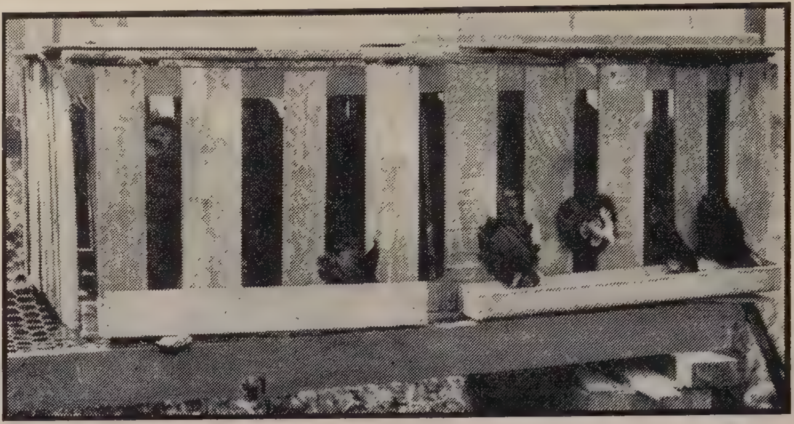
MOLYBDENUM REQUIREMENTS JUDGED ON pH. AND SOIL TEST



Combating Broodiness in the Household Poultry Flock

By H. K. MULLINS, Poultry Instructor,
Department of Agriculture, Hastings

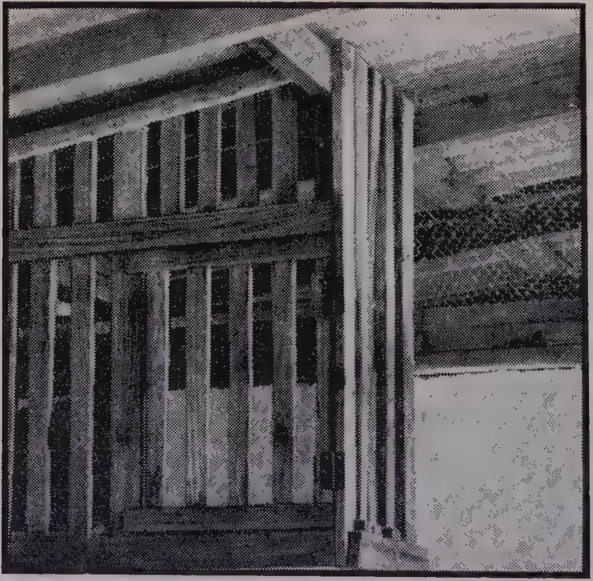
IN recent years there has been a marked increase in the popularity of Australorps, crossbreds, and Rhode Island Reds as winter producers for both commercial and household poultry flocks. These breeds, though excellent layers, may have a high incidence of broodiness, which can prove an embarrasssment to the household poultry keeper during summer. Generally a backyard flock of a dozen hens will yield from 7 to 10 eggs daily, but this amount can be lowered considerably by excessive or sustained periods of broodiness. Broodiness is a much greater problem in the warmer weather, because fowls react to the natural seasonal impulse to sit on their eggs.



A broody coop for use outside a laying house. [*Fraser Niederer*

THE control of hens which become broody is often haphazard, and such methods as plunging the bird in a tub of water or tethering it by one leg on the lawn are used far too commonly. To encourage the birds back into production as soon as possible there should be no change in the customary feeding programme. Starving the birds will result in a longer period elapsing before production recommences, and the risk of forcing the birds into a moult is also increased. Fresh water and greenfeed should be provided at all times.

If a hen is allowed to sit on the nest for a week before she is removed, it is far more difficult to get her off the "cluck" than if she had been removed the first night. A sound practice is to go round every night just after dusk and remove from the nest any birds showing a tendency to go broody.



A broody coop built in as part of a laying house.

Housing Broody Hens

Housing the broody hens should present no difficulty to the backyard poultry keeper. One of the most efficient and hygienic methods is to build a coop 5ft. x 2ft. x 2ft. on the inside wall of the laying shed. This will provide accommodation for 3 or 4 hens, and provided a slatted floor is incorporated in the coop, a quick return to production can be expected in about a week. An alternative method is to confine the birds to a coop on the lawn until the period of broodiness is over. Unless the birds are from a particularly broody strain, they will not go broody more than twice during the season. A common and effective method of marking broody hens is to place a different coloured ring on a hen each time she goes broody. For instance, a yellow ring would denote once broody, a red ring twice, and a blue ring would indicate that the bird had been broody three times. In this way the birds displaying excessive broodiness could be disposed of at the end of the year and not retained for another season's laying. Broodiness cannot always be regarded as a factor in ordinary culling, as many excellent layers go broody. Provided immediate action is taken when they go broody, these same hens are capable of a high sequence of eggs between broody spells.

Apart from the loss of production incurred broody hens can cause a good deal of trouble in the household poultry flock through frequently breaking eggs by moving about in the nest. By occupying nest space they also force other birds to lay on the floor, thus incurring further loss through breakages and loss of eggs in the litter. Broken eggs in nest boxes and on the floor can lead very quickly to egg eating, a vice that is particularly difficult to stop once it gets a hold in a flock. Household poultry keepers often fail to provide sufficient nests for the flock, with the result that during the flush months, when production is at its heaviest, 2 or more birds will endeavour to share the same nest. The position is aggravated further if broody hens are permitted to remain on the nests for several days before they are removed to other quarters. One nest should be provided for every 4 hens if broken eggs are to be cut to a minimum. The measurements of an ideal nest for heavy breeds should be approximately 12in. high, 12in. wide, and 14in. deep.

The practice of running male birds for table purposes with the laying flock is detrimental to the quality of the eggs, particularly if the eggs are left under broody hens all day. Infertile eggs are far superior for preserving, but care should be taken to see that they are gathered frequently and cooled thoroughly before storing. In every breed there are strains less prone to broodiness than others, and by careful selection of such strains it is possible to keep the broody factor at a minimum. General experience has shown that in crossbreds the White Leghorn male mated to heavy breed females gives a lighter incidence of broodiness than does the opposite cross. The non-broodiness of White Leghorns accounts in no small measure for their popularity, and it is probable that this factor will continue to operate in their favour for many years. However, it is in winter, when eggs are expensive, that the household poultry keeper relies on good production, and in winter egg production the Australorp and crossbred have clearly demonstrated their superiority.

Foods and their Relation to Allergy

MANY fallacious ideas are held about certain foods and their responsibility for allergies, and in this article Evelyn E. Moore, Field Officer in Rural Sociology, Department of Agriculture, Palmerston North, briefly discusses the relationship of food to the development of these complaints.

A PROPORTION of the population—how large it is difficult to say—has some tendency to develop allergies in one form or another toward the proteins in foods, flower pollen, and other substances which may accidentally be inhaled as dust or eaten. An allergy manifests itself in various ways, hay fever and hives or "heat spots" being two of the most common. Eczema, asthma, and vomiting are other more serious symptoms of allergy.

Causes of Allergy

Allergy is generally caused by some protein from the offending substance entering the blood accidentally, where it acts as a foreign body and sensitises the person to the food or other substance. Subsequently contact with the same food or other substance causes the allergic reaction. Sometimes, however, if the food causing the allergy is avoided for a while, the substance which has formed in the blood and has been distributed throughout the body and which, when combined with the food, produces the allergic reaction may gradually disappear and the sufferer may recover and completely outgrow the allergy. This applies especially with children who develop allergies to certain foods. Thus it is frequently possible to prevent or cure a food allergy once the offending food is known.

Allergies may develop toward any protein-containing food. Thus the idea that certain foods were "heating" to the blood and others "cooling" is groundless, and similarly other ideas about certain food combinations being harmful can generally be traced to unfortunate persons with allergies to the foods condemned.

Remedies

Sometimes when an allergy develops to some healthful or very commonly used food such as milk, eggs, and wheat or wheat products it is possible to cure it by a series of injections, as these are difficult foods to avoid altogether. Other foods such as strawberries, mushrooms, cucumbers, and certain other vegetables and fruits are not so important in the diet, and if these cause trouble, the easiest course would probably be to avoid them.

When allergies develop to foods which are eaten comparatively infrequently or to seasonal foods the causes are usually easier to trace, as the symptoms are distinct after a meal of the offending food. With some foods such as mushrooms food poisoning may even be suspected, and indeed to the person concerned an allergy reaction is a sort of poisoning.

When allergies are developed toward common foods or substances, however, the symptoms may not develop suddenly. The symptom may be a recurrent eczema, for example, with occasional flareups, and it is then advisable to consult a doctor, who will be able more easily to discover the offending substance and decide on treatment.

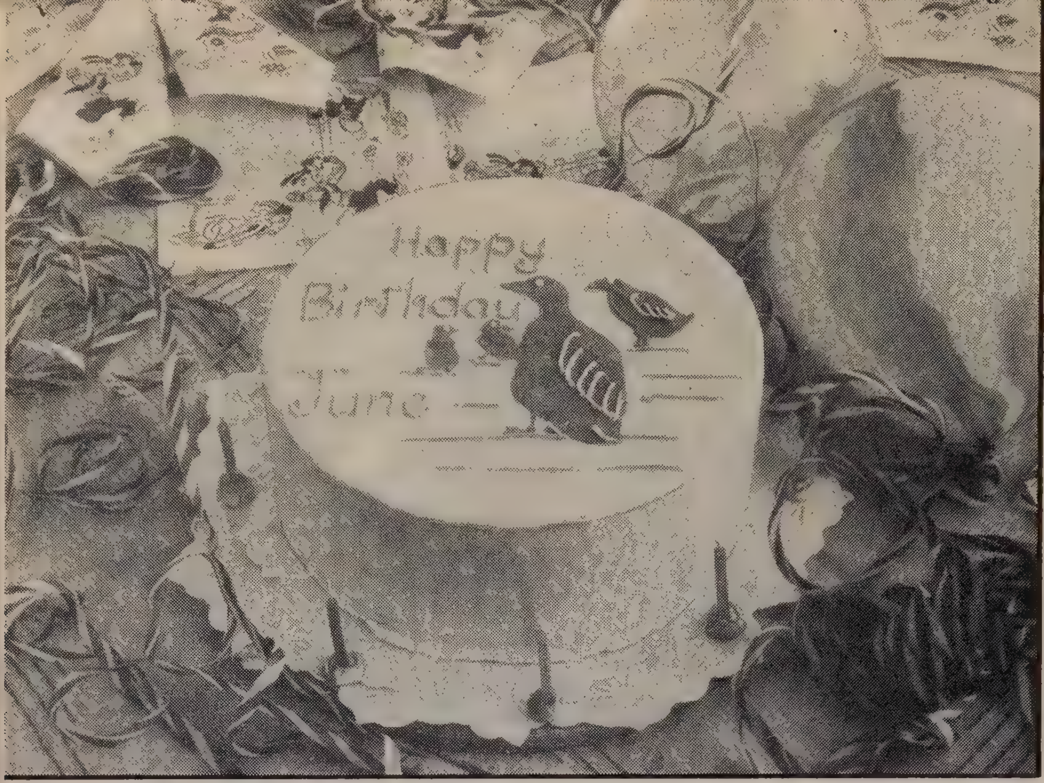
There are, of course, food faddists who give allergy as a reason for avoiding food when the real reason is dislike for the food concerned; this is not an allergy, for people sometimes develop allergies toward their favourite foods. In this respect food fads in children should be discouraged where possible, as such fads may not only be a nuisance and even an embarrassment to those who have to entertain the faddist, but carried to extremes may result in the diet having a low nutritive value.

As it is very rare for all members of the family to develop an allergy to the same food, it is not necessary to exclude such food rigidly from the family diet, although an allergic person would have to avoid it. Where a food of high nutritional value is concerned care should be taken to plan the rest of the menu to ensure an adequate intake of nutrients necessary for health.

Other Causes

Many garden plants, shrubs, and weeds, household dust, kapoc, feather pillows, and other household materials are capable of causing allergy in one form or another for which food may often be blamed, so if a child should develop a particularly troublesome symptom, it is advisable to explore the possible cause thoroughly.

A wholesome, well-balanced diet containing adequate amounts of fruit, green vegetables, milk, eggs, whole cereals, and meat, as recommended by the Department of Health, and plenty of rest, with fresh air and outdoor exercise, are often important factors in helping a child overcome such a complaint.



Simple Cake Decoration

By MOLLY MACPHERSON, Field Officer in Rural Sociology, Department of Agriculture, Auckland

DECORATING cakes offers more scope for originality than does any other branch of cookery. It is more a matter of having ideas than anything else. The decoration can be simple or elaborate and if the icing is not royal icing, it is not necessary to be too particular about getting an absolutely smooth surface. Icing which shows the marks of the spatula, knife, or fork is natural and can be most attractive.

HOWEVER, cake decoration does not necessarily mean decoration with icing. With some cakes, especially those of the sponge type, a heavy, elaborate icing does not seem to harmonise with the light spongy texture. A light icing, whipped cream, or simply a sprinkling of sifted icing sugar will be a pleasing decoration (see lower illustrations on this page and the opposite page).

The type of icing or frosting chosen should be in harmony with the texture and type of cake. Avoid crude colours and clumsy designs and patterns.

Decoration before Cooking

Dried fruit, nuts, or preserved fruit drained make a very effective and quick decoration if they are arranged in patterns on top of the cake before it is cooked, or they may be arranged in the bottom of the tin before the cake mixture is put in. After the cake is baked it is inverted so that the fruit or nuts form a top decoration (see the upper illustration on the opposite page).

The cake to be decorated can be placed on the plate it is to be served from if the plate is protected from drops of icing and icing sugar by strips of waxed paper under the edges of the cake (see upper illustration on page 573). The strips of paper together with drops of icing are removed after the decoration is complete.

Remember when Icing

1. The icing must have a smooth texture and be free from lumps.
2. Unless otherwise stated in the recipe, the cake must be cold and free from loose crumbs.
3. The icing must be firm and cool enough not to run or soak into the cake.
4. If the sides are to be iced, they are best done first before the top icing.

Simple Decoration

Cakes can look simple, attractive, and effective if the icing is put on the cake with a knife, fork, or spoon to give a rough-cast finish, swirls, or wavy or straight lines. Use a butter icing or boiled icing, as these keep the shape of the marking better than a glace (water) icing.

Piped Decoration

There are several icing forcers with tubes available, or an icing bag (pastry bag) of strong material (drill) may be obtained or made. Various tubes are available and are put into the end of the icing bag; then the icing is put in and forced through the tube.

A ring sponge and small cakes which have been simply decorated with whipped cream and chopped jelly.

Greaseproof paper may be folded to form a funnel for an icing forcer. The tip of the paper funnel is cut off to allow a tube to be used in it. After icing has been put in the paper funnel the top is folded down and the icing is forced through the tube to make the piped decorations. The base icing for the piping decorations should be as firm and as nearly set as possible.

Other Decorations

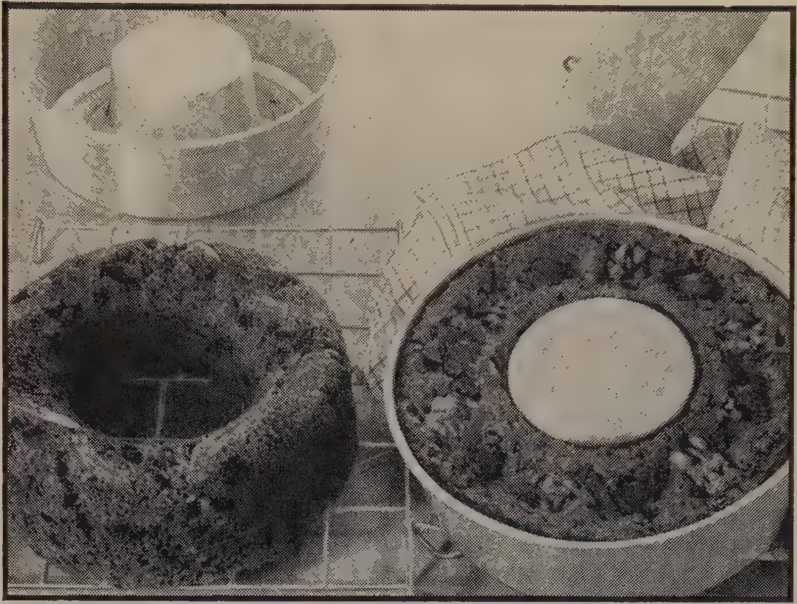
To all icings and whipped cream may be added garnishes such as dried fruit, nuts, hundreds and thousands, silver cachous, coloured sweets, and coconut or inedible decorations such as holly, keys, etc. (see the lower illustration on page 573). Such decorations should be put on to the icing base before it sets, unless the base is of royal icing, when it is sometimes better to put some decorations on to a firmly set icing with a little wet icing.

Stencil Decoration

Not all cake decorators can draw flowers, trees, or animals well, but these types of decorations can be done with stencils. Any simple cut-out design will do as long as the paper is fairly stiff and firm. Suitable designs are often found in children's picture books.

The cake needs at least one coat of firm icing for a background to the stencil. Place the stencil on the cake and secure it firmly with pins (see lower right illustration on page 572). Fill in the stencil design with icing in a shade contrasting with the background. Carefully remove the stencil and allow the icing to set. When set the design may be outlined with piping or eyes, etc., marked with piping.

Needlework transfers also assist decorators who cannot draw well. Choose a suitable transfer (or drawing) on thin paper with a clear outline and place it on the cake, which should have at least one coat of firm icing (not butter icing) for a background. Secure the design firmly with pins and with another pin prick along the outline to mark the design on the icing background. When the pattern has been completed remove the transfer. Pipe with a writing tube the outline of the pattern marked with pin pricks.



Cakes decorated with fruit and nuts before baking.

Chocolate Decorations

Grated chocolate makes an attractive garnish on icings or whipped cream.

Melted chocolate: Break or grate chocolate into a bowl or double boiler and melt it over boiling water. Add a little water if the chocolate does not melt easily. The melted chocolate can be dribbled from a spoon to give a rough-cast finish, swirled design, etc., on iced cakes. Melted chocolate may be folded into a boiled frosting for a marbled effect (see upper left illustration on page 572) before being spread on the cake.

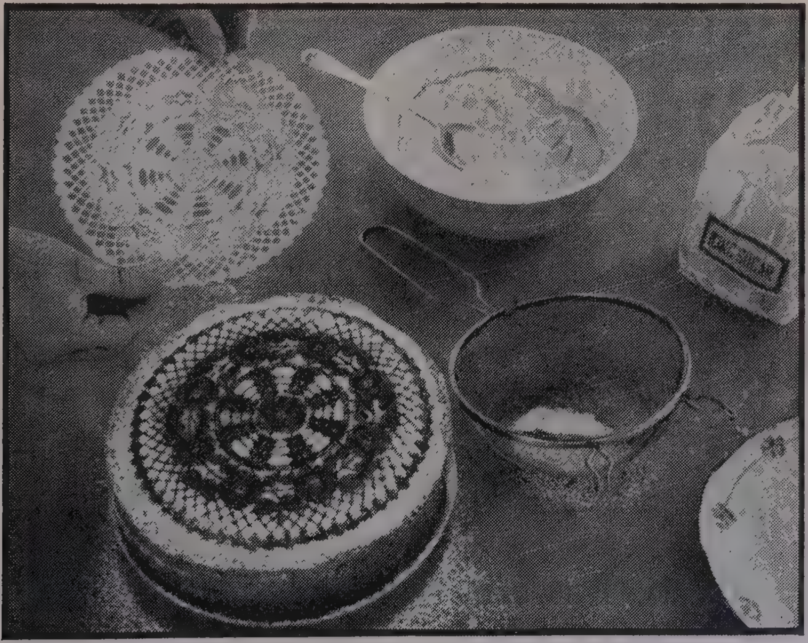
Chocolate-dipped banana slices: Dip thick banana slices into melted chocolate. Drain the slices on greaseproof paper and when the chocolate has set use the slices as decoration on whipped cream or boiled frosting. Slices of banana used raw as a decoration turn an unattractive brown after exposure to the air for some time.

Feather Icing

To make feather icing first coat the top of the cake with glace icing and while it is still wet pipe straight lines of glace icing across the surface in a contrasting colour or dribble glace icing from the tip of a spoon in straight lines across the iced surface of the cake. Then mark with a skewer or pointed knife cross lines going left then right to form a feather pattern (see the lower left illustration on page 572).

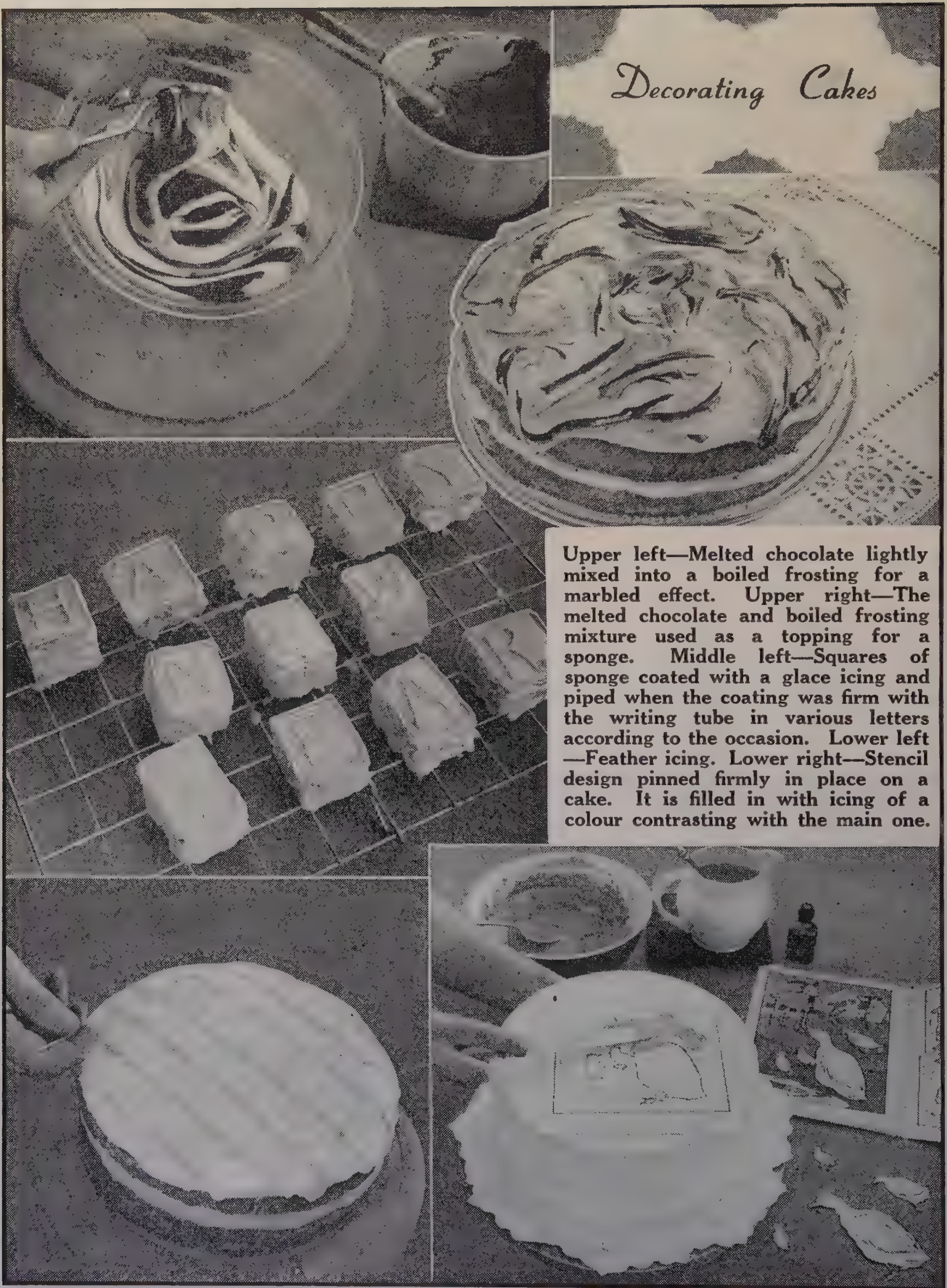
Jelly and Coconut Decoration

Jelly and coconut decoration is suitable for light cakes such as sponges. The method for making it is similar to that for lemingtons. Make up half a packet of jelly crystals according to directions and when the jelly is cold but not set pour some of it into a flat plate. Place the cake in the jelly so that the bottom is lightly coated. Coat the top and sides in the same way,

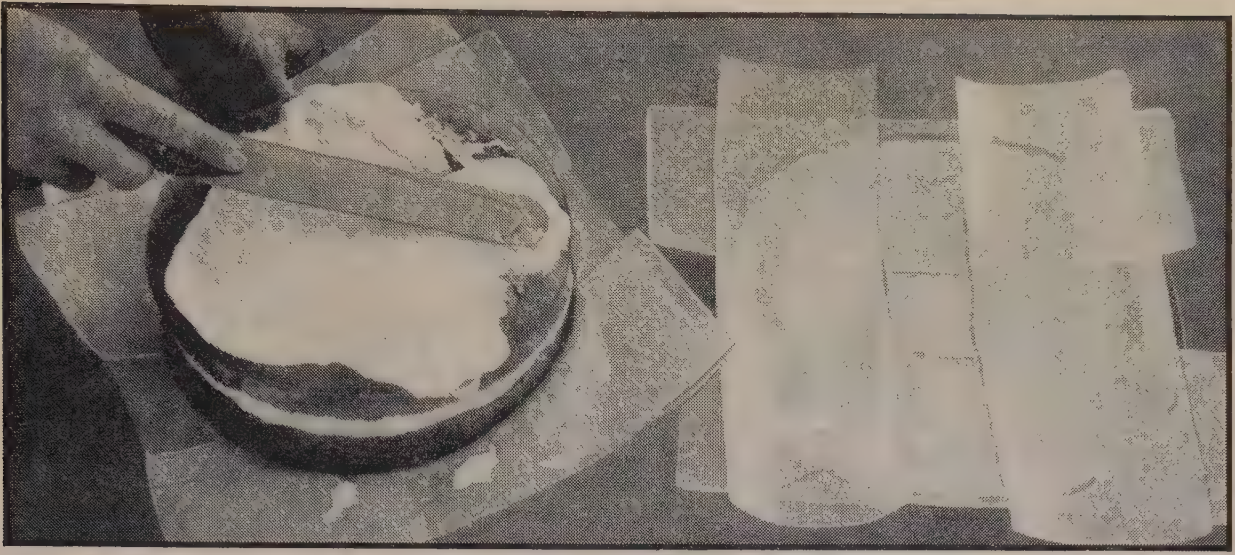


Patterns can be made by sifting icing sugar on to a sponge with a paper doily placed on top. After sifting the sugar, carefully remove the doily.

Decorating Cakes



Upper left—Melted chocolate lightly mixed into a boiled frosting for a marbled effect. Upper right—The melted chocolate and boiled frosting mixture used as a topping for a sponge. Middle left—Squares of sponge coated with a glace icing and piped when the coating was firm with the writing tube in various letters according to the occasion. Lower left—Feather icing. Lower right—Stencil design pinned firmly in place on a cake. It is filled in with icing of a colour contrasting with the main one.



After icing is completed strips of paper placed as shown at right together with any drops of icing are removed, leaving the cake on a clean plate. Cracks which may occur in the icing through handling of the iced cake are thus avoided.

adding more jelly when necessary. Next place the whole cake in a flat plate covered with coconut so that the coconut sticks to the jelly. Cover all the sides with the coconut. The cake may be split sideways and a filling put in.

Coloured coconut can add variety, or desiccated coconut may be put in the oven and toasted. Stir occasionally so that the toasted shreds are spread throughout. To colour coconut put a few drops only of the required food colouring on the coconut and mix thoroughly with a fork, or shake a few drops of food colouring and coconut together in a jar.

Decorating Small Cakes

Small cakes can be decorated with all icings and garnishes used on larger cakes. A quick way when icing small cakes is to dip the top of the cake into the bowl of icing to coat it.

Icing Recipes

Some recipes for icings follow:—

Vienna Icing

8oz. of butter
4 to 6oz of icing sugar
Colouring and flavouring to taste

Cream the butter and add the icing sugar. Add the colouring and flavouring. Beat the mixture until it is smooth and creamy. After icing the cake place it in a cool place so that the icing may harden.

A great variety of cake decorations is available.

Butter Icing

2oz. of butter
8oz. or more of icing sugar
Colouring and flavouring to taste

Cream the butter and add the icing sugar. Add the colouring and flavouring. A little milk may be added if the mixture is too dry. Beat the mixture until it is smooth and creamy. After icing the cake place it in a cool place so that the icing may harden.

Glace Icing

8oz. of icing sugar
3 tablespoons of boiling water
Colouring and flavouring to taste

Add more icing sugar than specified if the mixture is too thin or more water if it is too thick. Mix the ingredients. To facilitate the spreading of the icing on the cake dip the knife or spatula into a jug of hot water from time to time.

Boiled Frosting

1 egg white unbeaten
¾ cup of sugar
2 tablespoons of cold water
¼ teaspoon of cream of tartar
Pinch of salt
Flavouring

(Sufficient for top of 1 cake or 12 small cakes.)

Combine the ingredients in the top of a double boiler. Stir until the sugar dissolves, then place over briskly boiling water. Beat the mixture with the beater until it stands in peaks (6 to 10 minutes). Add flavouring and beat until thick enough to spread. During cooking clean the sides of the container down with a spatula.

Torte (Baked Frosting)

1 egg white
½ cup of brown sugar
¼ cup of chopped nuts

Make a meringue of the sugar and egg white. Fold in the chopped nuts. Spread the mixture on top of the cake. Place in the oven until the meringue has browned.

All photographs by Sparrow.

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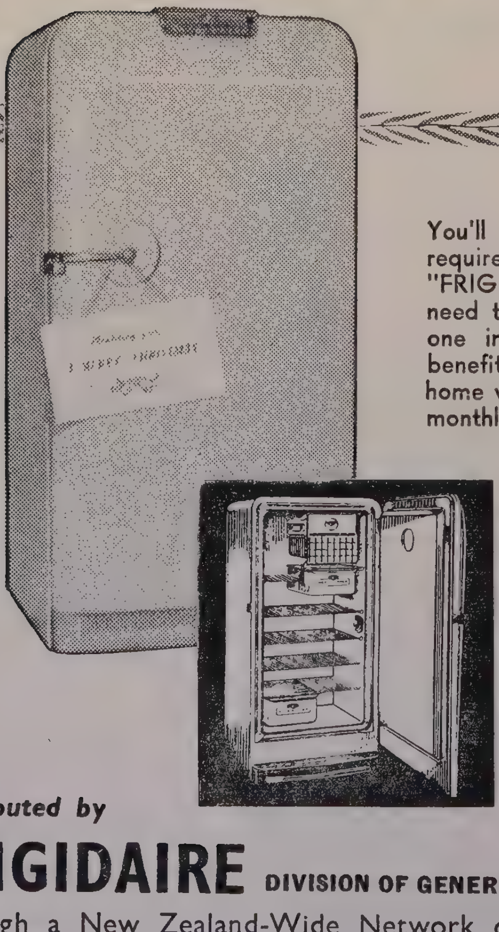

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Feeding the Adolescent

By ELEANOR COUSTON, Field Officer in Rural Sociology, Department of Agriculture, Timaru

"HOLLOW legs" is an expression which aptly describes the apparently insatiable appetite of the adolescent. At that stage of development nutritional needs are very high, exceeding those of most adults. It is a period of rapid growth and generally one of great physical activity, and these factors increase the requirement for those foods which will build and repair muscle and organ tissues, fortify bones and teeth, meet the high energy output, and provide the essentials for maximum vitality and well-being.

THE adolescent spurt is a normal phase in physiological development and usually takes place between 12 and 16 years of age in girls and between 12 and 18 in boys. Including in the meals a good selection of the more valuable foods will reduce the temptation to fill up on cakes, sweets, pastries, and biscuits, and lead to greater physical fitness and mental alertness.

Basic Dietary Plan

In the light of present knowledge based on experimental work of scientists and nutritionists throughout the world a simple plan has been formulated as a guide for each day's food. Providing these essentials are taken, other foods may be included to satisfy appetite and to maintain interest. Perfect nourishment cannot be assessed in terms of food alone, but is determined also by physical and psychological factors such as good cooking, good serving, and pleasant atmosphere.

The amounts of food required from each group will vary according to age, activity, and other conditions, but to meet the requirement of the adolescent the following should be taken daily.

Milk (1¾ pints): Part may be substituted by dried, whole, skimmed, or evaporated milk. To be used as beverages or in cooking.

Cheese (1 small cube): Raw or in cooked dishes.

Eggs (3 to 5 per week. One per day when plentiful.)

Meat, liver, or fish (1 serving per day. Liver to be included once per week.)

Potatoes or kumaras (generous serving).

Vegetables: Green vegetable, cauliflower or swede, and another vegetable. Extra vegetable in soups or salad.

Fruit: At least one serving of citrus fruit or tomatoes; or black or red currants, gooseberries, Chinese gooseberries, tree tomatoes, raspberries, or other berries; or Sturmer apples. Other fresh, stewed, or dried fruits as desired.

Butter and fat (at least 1oz. of butter): Other fats as desired.

Bread: Half the week's supply should be wholemeal.

Cereals: Whole-grain cereals such as oatmeal, rolled oats, or unrefined wheaten cereal to be taken as porridge. If prepared breakfast cereals are used occasionally, add wheat germ.

Iodised salt: For both cooking and table use. The inclusion of iodised salt is necessary only in countries such as New Zealand, where the soil is deficient in iodine.

Fish liver oil (1 teaspoon per day unless exposure to the sun is assured).

Additional foods: Honey, marmalade, jam, yeast extract, and peanut butter. Dried peas, beans, or lentils may be used in soups or savoury dishes occasionally in place of meat or eggs.

Special Needs

For heat and energy: Extra carbohydrates and fats are needed because of increased activity, and these are best supplied by extra servings of potatoes, bread, cereals, and butter. Honey, jam, and sugar also have fuel value, but as adolescence is the time when there is the greatest incidence of dental decay, excessive use of sugar and sugar-containing foods is not desirable. An adolescent boy requires the same fuel value as a man doing heavy manual labour and a girl the same as a moderately active woman.

For building and repairing muscle: Extra protein in the form of milk meat, eggs, and cheese is required during adolescence to allow for rapid growth and to supply muscular activity. The requirement for girls is greater than for any active woman (other than during pregnancy or lactation) and for boys greater than for a man doing heavy work.

For vitality and protection against ill health: Minerals and vitamins are needed in liberal supplies and these are furnished by the recommended intake of foods from the basic plan.

The requirement for iron to prevent anaemia and to ensure healthy blood is high at this stage and such foods as liver, kidney, heart, eggs, whole-grain cereals, and green vegetables are good sources of this mineral.

Increased amounts of calcium (for the growth and strengthening of bones) and to help prevent dental decay are provided by the liberal amount of milk and the use of cheese.

Iodine also is especially necessary during adolescence and therefore it is important to use iodised salt for table and cooking purposes to guard against possible iodine deficiency with resultant goitre.

Vitamins

Although there is little evidence of acute vitamin deficiency in New Zealand, adequate amounts of vitamins are necessary for the maintenance of good health, for protection against certain infections, and to keep body processes running smoothly. Briefly their functions may be summarised as follows:—

Vitamin A is necessary for growth and for the health of the eyes, skin, and mucous membranes. Lack of this vitamin leads to night blindness. Good sources of vitamin A are fish liver oils, liver, butter, milk, cheese, green vegetables (particularly the darker green leaves), and some yellow vegetables and fruits.

The **vitamin B** family of vitamins includes thiamin, riboflavin, niacin, and others. Lack of one or other of these may lead to digestive troubles, fatigue, and irritability, cracks at the corners of the mouth, and decreased physical and mental efficiency. The B vitamins are part of an enzyme system which enables the body to utilise the carbohydrate, fat, and protein in food. Good sources are whole-grain cereals, liver, pork, legumes, yeast extract, wheat germ, eggs, and milk.

Vitamin C is needed for normal bones, teeth, and gums, and for the health of the blood and blood vessels. Good sources are citrus fruits and other fruits listed in the basic dietary

Christmas Cooking—

RECIPES *that* APPEAL

CHRISTMAS CAKE

1 lb. butter, 1 lb. sugar, 10 eggs, 1 heaped teaspoon *Edmonds Baking Powder*, 2 lb. flour, 1 lb. currants, 1 lb. sultanas, 1 lb. raisins, 4 oz. mixed peel, 4 oz. almonds (chopped), wine-glass brandy.

Beat butter to a cream, add sugar, then eggs one by one (unbeaten); mix baking powder with flour, and put in, then fruit dredged with flour, lastly brandy. Cook $4\frac{1}{2}$ hours in moderate oven, 350°F.

CHRISTMAS PLUM PUDDING

$1\frac{3}{4}$ lb. flour, 4 teaspoons *Edmonds Baking Powder*, 12 oz. breadcrumbs, $1\frac{1}{2}$ lbs. chopped suet, 12 oz. brown sugar, 1 dessertspoon treacle (or more), 9 eggs, $\frac{1}{2}$ teaspoon essence of lemon, 2 cups milk, $1\frac{1}{2}$ lb. sultanas, 1 lb. currants, 1 lb. raisins, 8 oz. almonds (blanched), 8 oz. mixed peel, $\frac{1}{2}$ packet spice, $\frac{1}{2}$ level teaspoon salt, $\frac{1}{2}$ nutmeg (grated), 2 tablespoons brandy.

Mix well dry ingredients, add fruit previously prepared, treacle, eggs well beaten, and lastly milk, essence and brandy. Darken with burnt sugar if desired. Put into scalded and floured pudding cloths or into well greased basins covered with scalded and floured pudding cloths. If divided into two, boil 8 hours: if into four, boil 6 hours. Serve with *Edmonds 'Sure-to-Please' Custard.*

HOME-MADE LOAF

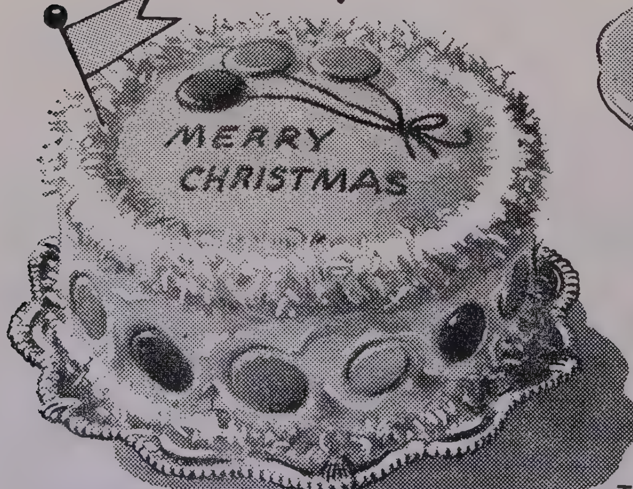
4 cups flour, 1 teaspoon salt, small cold boiled potato, milk, or milk and water, 2 raised teaspoons *Edmonds Baking Powder* (Sure-to-Rise or Acto), $\frac{1}{2}$ teaspoon sugar.

Sift together flour, sugar, salt and baking powder, then rub in potato. Add sufficient liquid (about a pint) to make a soft and smooth dough. Mix quickly, put at once into a greased tin $\frac{3}{4}$ full, smooth top with a knife dipped in melted butter, and bake immediately about $\frac{3}{4}$ to 1 hour in a hot oven (400°F.) Cover over with paper for first 10 or 15 minutes to prevent crusting too soon. When done, take from tin and wrap in a bread cloth until cold.

The name

EDMONDS

spells cooking success!



EDMONDS

"Sure to Rise"

baking powder

EDMONDS
PRIZE
BAKING POWDER
TJE

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pattern, rose hip syrup, most green, leafy vegetables, turnips, and swedes. Potatoes contain a fair amount and are a regular source when fruit is in short supply.

Vitamin D promotes growth and is essential for bone and teeth formation. It is a protection against rickets and other bone deformities. It also permits the body to use to the best advantage the calcium and phosphorus present in food. Vitamin D can be obtained from the action of sun on the skin, from fish liver oils, and in smaller amounts from eggs, cheese, butter, and milk.

Vitamin K helps in the clotting of blood. It is found in cabbage, cauliflower, spinach, and kale.

If the basic dietary plan is followed, all these food factors will be supplied, and good food habits established during these impressionable years will form a sound foundation for the maintenance of health during adult life.

The Day's Meals

Probably the most important meal of the day, breakfast is frequently neglected or turned into a hasty scramble for an inadequate stop gap of tea and toast. Even sleeping uses energy and nutritionists and health authorities agree that a quarter to a third of the day's nutrients should be taken after the long fast during the night. Scientific studies have proved that with a good breakfast college boys and girls work better, think better, and are calmer and steadier. A study conducted at a big mid-western university in the United States on healthy, normal girls gave the results shown in the upper graph on this page. The fact that many people say they are not hungry in the morning reflects the establishment of poor food habits and it is often necessary to build up gradually by starting with small, well-balanced meals. The time factor is important, but it repays well in efficiency and energy to make time and allow an extra ¼ hour to sit down and enjoy breakfast in comfort. If breakfast is neglected, the tendency to fill up on poor between-meal snacks becomes a habit.

BREAKFAST

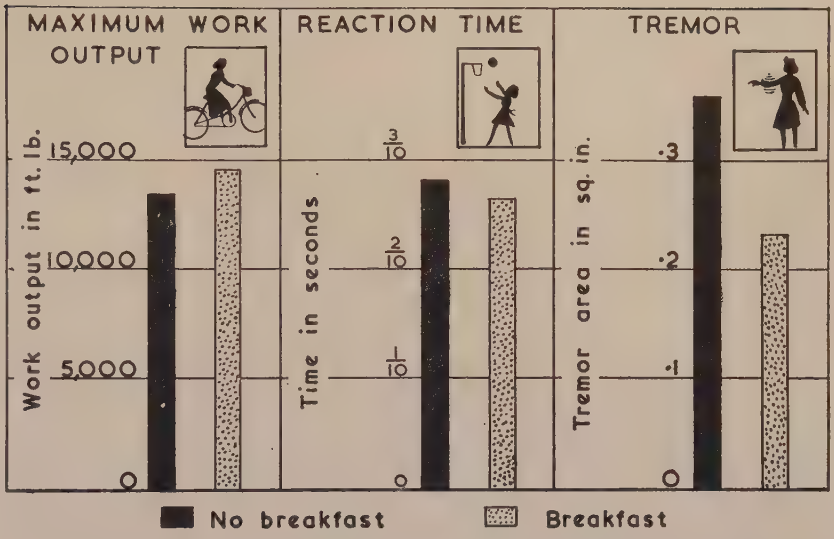
A good breakfast for the adolescent will consist of:—

Fruit or fruit juice
and porridge made with oatmeal, rolled oats, or whole-grain wheaten cereal
or Fruit
and cooked dish, such as egg, bacon, liver, kidney, or fish
or Whole-grain cereal
and cooked dish
Bread or toast, preferably wholemeal
Butter, marmalade, honey, etc.
Milk or milk beverage

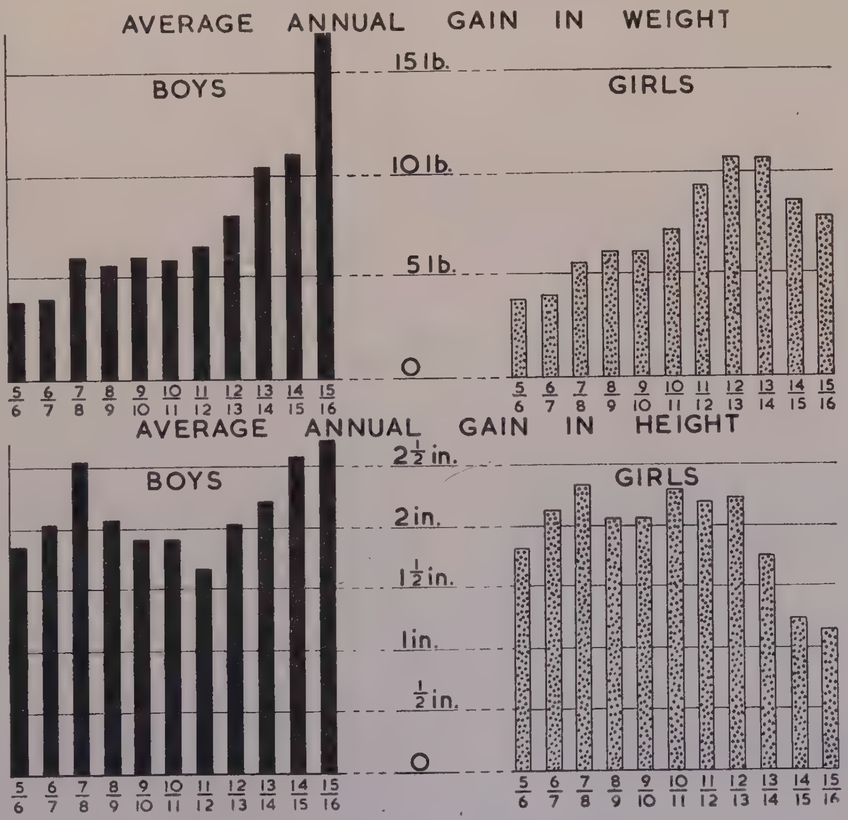
LUNCH

Lunch served at home should consist of:—

Soup with milk basis, or pea or lentil soup
or Cooked dish—egg, cheese, meat, or fish
or Salad, with cold meat, fish, cheese, or egg
Fruit
Bread, scones, bran muffins, etc.
Butter, cheese, yeast extract
Milk beverage



Experimental work has been carried out in the U.S.A. on a group of six normal, healthy young women in an endeavour to determine the effect of altered breakfast habits on physiologic responses. In the "Journal of Applied Physiology" for February 1949 the results are published of test periods of (a) heavy breakfast followed by no breakfast and (b) heavy breakfast followed by coffee only and then by light breakfast. Although these results can be regarded only as studied disturbances in normal habits rather than experiments in established habits of indefinite duration, the indications are in favour of taking breakfast. The graph shows an average of the results obtained when a 3 weeks' period of heavy breakfast was followed by a similar period of no breakfast. The omission of breakfast caused a decrease in maximum work output, an increase in reaction time, and an increase in tremor magnitude.



The average increase in weight and height for each year of age for 10,000 boys and 10,000 girls. The adolescent spurt, which is earlier for girls than for boys, can be noticed. The information shown in the graph is from a report on the heights and weights of schoolchildren in the County of London in 1949.

PACKED LUNCH

Carried lunches are frequently lacking in protein or muscle-building foods and the essentials of an adequate packed lunch are:—

1. Two or more substantial sandwiches made from wholemeal bread with egg, fish, liver, cheese, cottage cheese, meat, peanut butter, beans, or nuts as bases.
2. One or more sweet sandwiches with dried fruits such as dates, raisins, etc.
3. Raw fruit or vegetable, such as apples (preferably Sturmer), oranges, tree tomatoes, bananas, tomatoes, carrot, cabbage, lettuce, celery, cress, and parsley. Something hard to chew at the end of the meal will clean the teeth.
4. Milk or milky drink.

These are the foundations of a good lunch, but packed lunches tend to become monotonous and to maintain interest it is well to include a surprise. This might consist of fruit salad or a dessert or home-made cookies and in winter the beverage will be much more attractive if it is hot.

DINNER

Dinner is less likely to be nutritionally inadequate than the other main meals, as national food habits tend toward a well-balanced meal. This will consist of:—

Meat, liver, or fish

Potatoes

Green vegetable, cauliflower, or swede

Another vegetable

Dessert

Important factors to be remembered are that green vegetables must be fresh and correctly cooked to retain their valuable nutrients and that the dessert should frequently be the medium of using some of the day's milk supply.

Between-meal Snacks

Between-meal snacks should consist mainly of milk or fruit. With three substantial meals the craving for sweet, carbohydrate foods will be diminished and the needs of the body and appetite satisfied with foods of good staying power.

Fallacies

Young, growing women are inclined to become figure conscious and though a trim figure is desirable, it is unwise to reduce their milk intake in the belief that it is fattening. Milk contains as much as 87 per cent. of water, whereas chocolate and other sweets are composed almost entirely of carbohydrate and fat. Potatoes too are often shunned, but once again their carbohydrate content is much lower than that of cakes, sweets, and pastries.

Young men can often be encouraged to good food habits by following the example of athletes. A mistaken idea is that athletes train on glucose, whereas this is taken mainly as a means of providing a rapid source of energy before a race. A survey carried out by the Ministry of Health in England on the diet, haemoglobin values, and blood pressures of Olympic athletes showed that the majority of these men stressed the value of generous amounts of meat, eggs, and milk during training.

Economy in Use of Foods

To supply the quantities of foods recommended for optimum nutrition it is necessary for many families to plan their food budget with care. Wise buying and careful planning will bring about a saving on many items and a knowledge of which foods give the best return for money spent is of value.

Cheaper cuts of meat have the same nutritive value as more expensive ones and can be made palatable and tender by long, slow cooking. Organs such as heart, liver, and kidney are of special value.

Fruits and vegetables in season are more reasonable in price and the preservation of fruits will ensure adequate supplies when they are scarce. Black currants and gooseberries are frequently available for the picking and are excellent sources of vitamin C. Home-grown vegetables are cheaper than bought ones and fresh from the garden they are higher in nutritive value.

Eggs for winter use should be preserved when they are cheap and plentiful.

Legumes (dried peas, beans, and lentils) are a cheap form of protein and can be used occasionally as a substitute for meat or eggs.

The use of retained heat and pressure cookers will reduce fuel costs.

Reliable recipes and careful measurements will ensure perfect results in cookery and so eliminate waste.

Stale bread makes good rusks or "scrunch" if oven dried and is good for teeth and jaw development. The whole-grain cereals are cheaper than prepared breakfast cereals and better value nutritionally.

Fats should be carefully rendered and used for cooking. Beef dripping can be used occasionally for a spread for bread.

The water in which vegetables have been cooked contains valuable nutrients and should be used in soups, gravies, and sauces.

All the essentials for good nutrition can be obtained from natural food sources and adequate sunshine. Vitamin pills are not necessary if the rules are followed, but in winter when exposure to the sun is not possible the addition of fish liver oil in some form is advisable. Throughout adolescence special stress should be placed on the serving of food of high nutritional value, and this, together with adequate sleep, exercise, fresh air, and sunshine, will make for maximum physical and mental efficiency.

Prevent Drownings

THE spectre of death spends almost as much time on New Zealand's beaches and near its rivers and harbours as it does on the highways. At least 65 persons will drown this summer—if past figures are a guide—causing untold grief and serious economic loss. About half that number will be children, up to the age of 15.

THE Prevent Drowning Campaign Committee believes that most of these drownings are preventable and is sparing no effort to reduce the annual figures of death by drowning.

Carelessness the Major Cause

Carelessness is the major cause of New Zealand's drownings. The foolhardy swim alone, beyond a safe depth, or too soon after a heavy meal. On patrolled beaches many swimmers ignore the flags marking safe areas and thereby become potential statistics. And many parents do not keep a keen and unremitting watch on young children who cannot swim.

Rivers and the open sea claim most drowning victims, but creeks, pools and ponds, tanks, water troughs, open drains, and ditches and water races, though more lightly regarded, are just as dangerous. Every farm has one or two of the last-named hazards.

Value of "Water Wisdom"

The committee believes that the best means of cutting the number of drowning fatalities to a minimum is a campaign of education. It intends teaching "water wisdom" in every conceivable way in the present season, using posters, pamphlets, radio, and newspaper and screen-slide advertising.

The new—to New Zealand—Holger Nielsen method of artificial resuscitation is well worth knowing. The Department of Health recently issued an excellent booklet containing information on various methods of applying artificial respiration and giving particular attention to the Holger Nielsen method.

The pamphlet "Be Water Wise", containing a summary of the Holger Nielsen method and other information, may be procured on application to Box 8007, Government Buildings, Wellington.

The Prevent Drowning Campaign Committee feels it would be even better to eliminate the causes of drowning and obviate the need to apply respiration.

Check **your** own position. Does your farm, station, or home contain danger points that could be corrected? Do you always exercise care when bathing? Could you apply artificial respiration if called on?

Making a Small Child's Smocked Frock

FASHIONS in trimmings come and go, but smocking takes no heed of this tide of popularity; it is an all-time favourite. It gives that much sought after hand-made touch to dresses, blouses, children's wear, lingerie, and especially is it in its natural setting on those indispensable smocks which save so much wear and tear on the clothes which they temporarily replace. Its charm lies partly in the speed and ease with which it can be accomplished and partly in being a simple decorative stitch suitable to any age and condition. The frock described in this article by Maud B. Strain, Field Officer in Rural Sociology, Department of Agriculture, Dunedin, is suitable for an average child of 9 months to 1½ or 2 years.

SMOCKING provides a convenient and artistic way of keeping fullness under control, in places where fullness is not desirable, without having to resort to belts and other constricting bands. The dress of a small child not yet walking needs to be full so as to hang freely while the child is being carried on the crook of one's arm, but this fullness should not be in evidence above the waist. Even a 3- or 4-year-old needs plenty of freedom of movement, and at this age a band of smocking round the waist will provide the necessary control and be decorative at the same time.

The frock in the heading photograph requires 1⅛yds. of 36in. material or 1⅜yds. of 30in. material. It can be made in a wide variety of materials: Silk, crepe-de-chine, nylon, haircord, lawn, handkerchief linen, viyella, clydella, and similar fabrics all being suitable. Nylon is ideal for laundering, because it requires so little ironing, unlike some other materials on which it is somewhat difficult to restore smocking to its original appearance.

The most satisfactory method of ironing smocking is to place it right side downward on a towel folded thickly and to press it lightly on the wrong side. The point of the iron should not be run into the gathers in case it breaks the smocking threads.

If a very fine material is being used and extra fullness is desired, this may be achieved by using a whole width for the front. An extra ¼yd. of material would then be required.

Drawing the Pattern

Following are the directions for drawing the pattern in the diagrams on page 581:—

Front of frock: A piece of paper 18in. by 14in. is required. It is helpful, though not essential, to have the paper ruled in 1in. squares.

Make a dot (W) ½in. down from the top line and on the left side line.

Make a dot (X) ½in. down from the top line and 3in. in from the right side line.

Draw a straight line joining W and X.

Make a dot (Y) 2¼in. down from the top line and 1¼in. in from the right side line.

Make a dot (Z) ¾in. up from the base line and on the right side line.

Draw a straight line to join Y and Z.

Join X and Y by a curved line to form part of an armhole.

Join the point at the bottom left corner (B) to Z by a slightly curved line.

Mark notches as indicated; they will be found helpful when making up the frock.

Back of frock: For this a piece of paper 18in. by 12in. is required.

Mark a point (W) ½in. down from the top line and on the right side line.

Mark a point (X) ½in. down from the top line and 3½in. in from the left side line.

Mark a point (Y) 2½in. down from the top line and 2in. in from the left side line.

Mark a point (Z) ¾in. up from the base line and on the left side line.

Draw a straight line from Y to Z and another from X to W.

Join X and Y by a curved line to form part of an armhole.

Join the point at the bottom right corner (B) to Z by a slightly curved line.

Mark a point (S) 3in. down from W on the right side line.

Sleeve: For this a piece of paper 7in. by 12in. is required.

Mark a point (A) 1in. up from the base line and on the left side line.

Mark a point (B) 4¼in. up from the base line and ½in. in from the left side line.

Mark a point (C) 4½in. up from the base line and 2in. in from the left side line.

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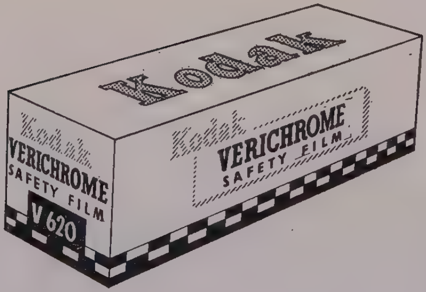
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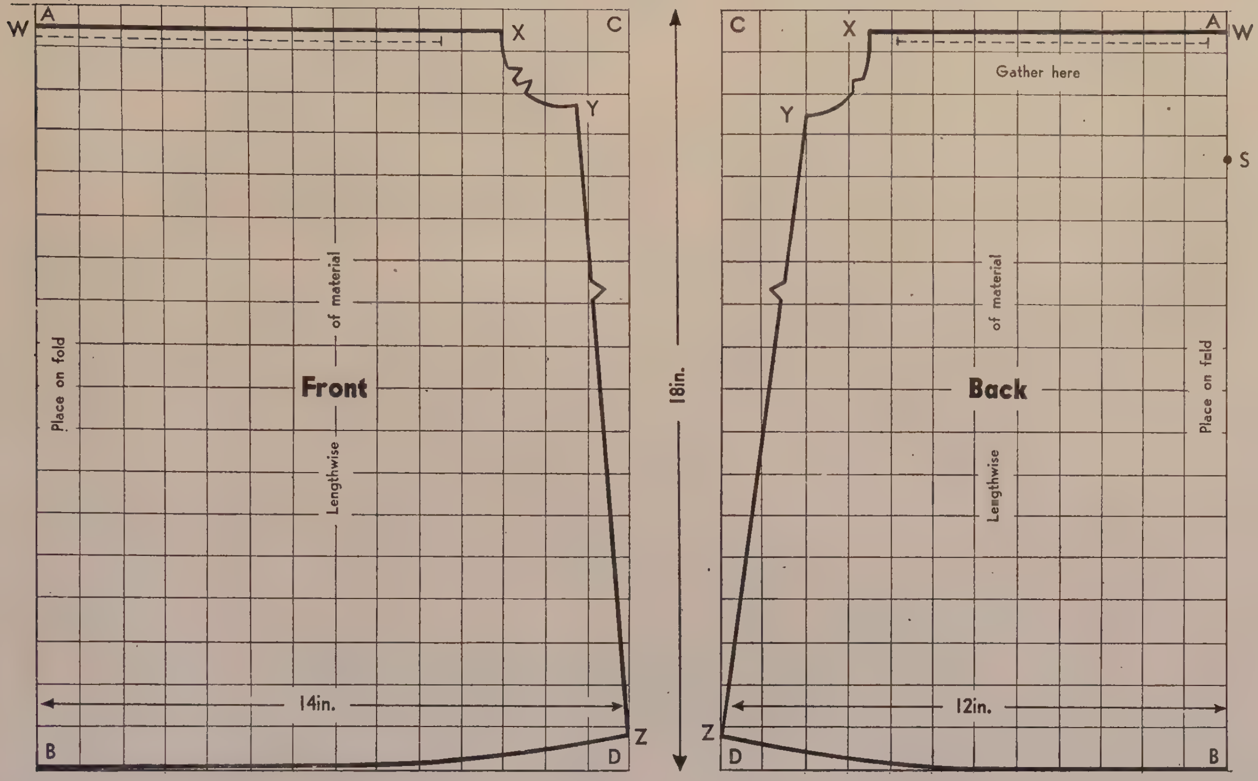
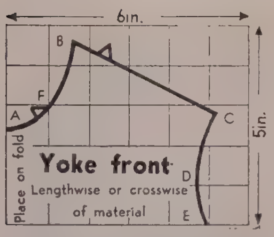
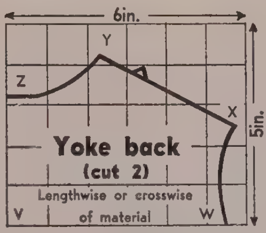
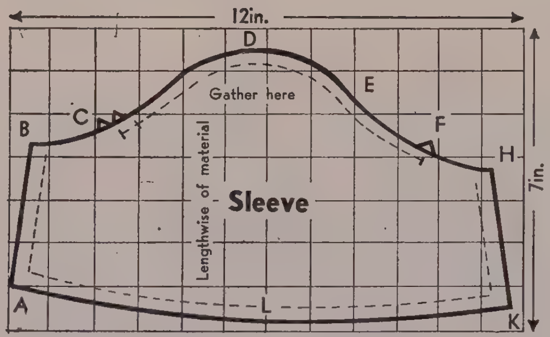
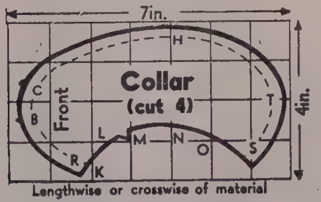

W
A
X
C
Y
Place on fold
Lengthwise of material
Front
14in.
B
D
Z
18in.
C
X
A
W
Gather here
Y
S
Lengthwise of material
Back
Place on fold
12in.
Z
D
B

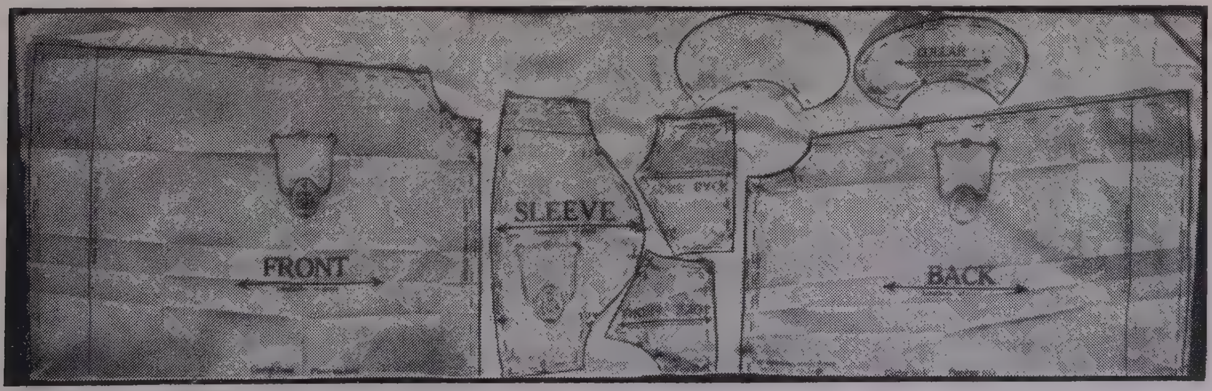

6in.
B
F
A
C
5in.
Yoke front
Place on fold
Lengthwise or crosswise of material
D
E


6in.
Y
Z
X
5in.
Yoke back
(cut 2)
Lengthwise or crosswise of material
V
W


12in.
D
Gather here
E
C
B
F
H
7in.
Lengthwise of material
Sleeve
A
L
K


7in.
H
Collar
(cut 4)
C
Front
B
T
4in.
L
M
N
O
S
R
K
Lengthwise or crosswise of material

Above and left—Parts of pattern for 30in. wide material. Below—Pattern in place ready for cutting out; the material is $1\frac{3}{8}$yds. of 30in. wide fuji silk.


COLLAR
SLEEVE
FRONT
BACK

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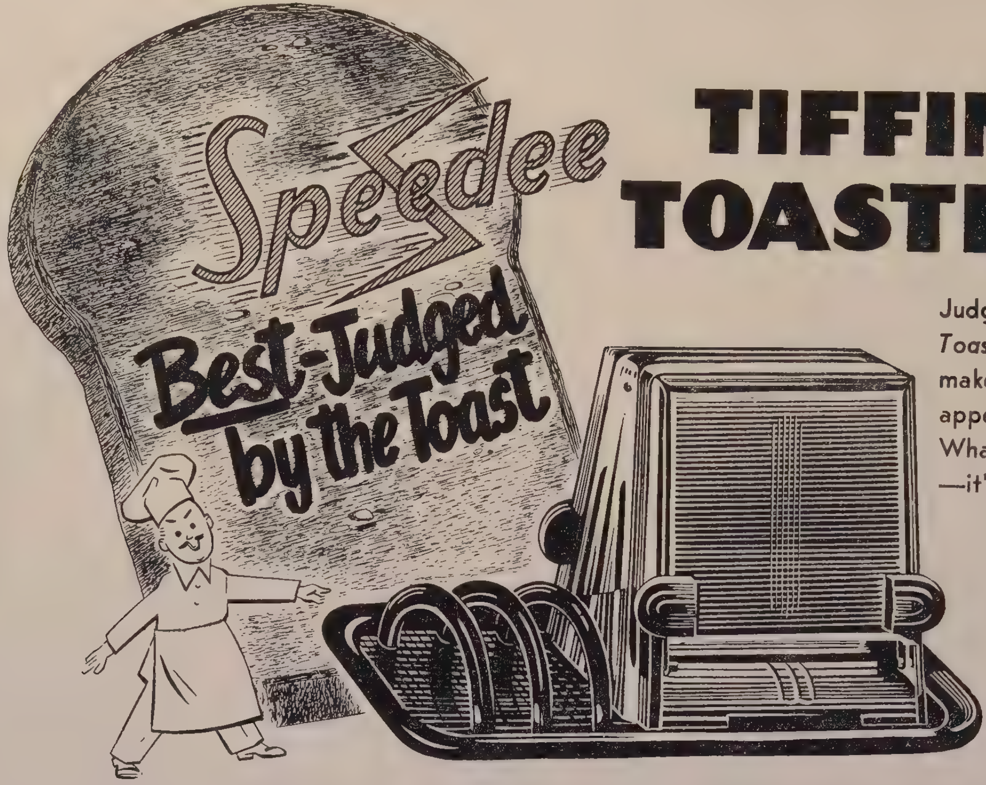

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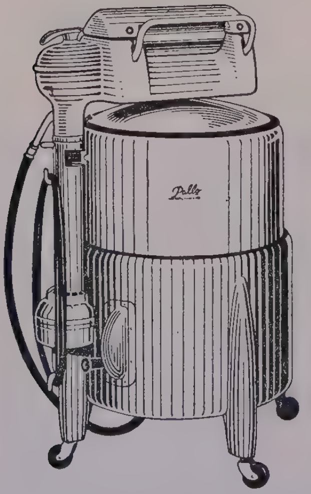

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TENNIS SHOES

Mark a point (D) 6½in. up from the base line and 5½in. in from the left side line.

Mark a point (E) 5½in. up from the base line and 4in. in from the right side line.

Mark a point (F) 4in. up from the base line and 2in. in from the right side line.

Mark a point (H) 3¾in. up from the base line and ¾in. in from the right side line.

Mark a point (K) ½in. up from the base line and ¼in. in from the right side line.

Mark a point (L) ¼in. up from the base line and 6in. in from the right side line.

Draw a straight line to join B to A and another to join H to K.

Draw a smoothly curved line joining the points B, C, D, E, F, and H.

Draw a slightly curved line joining the points A, L, and K.

This sleeve is intended to be gathered into a ¾in. wide sleeve band. For this, two strips of material 8in. long by 2¼in. wide are needed; this allows ⅜in. turnings all round. If a sleeve similar to the one in the heading photograph is being made, an extra inch should be added to the bottom edge of the sleeve pattern.

Yoke front: For this a piece of paper 6in. by 5in. is required.

Mark a point (A) 2⅜in. up from the base line and on the left side line.

Mark a point (F) 3in. up from the base line and 1in. in from the left side line.

Mark a point (B) 4¾in. up from the base line and 1⅝in. in from the left side line.

Mark a point (C) 2¾in. up from the base line and ¾in. in from the right side line.

Mark a point (D) 1in. up from the base line and 1⅜in. in from the right side line.

Mark a point E on the base line and 1in. in from the right side line.

Draw a straight line from B to C.

From A draw a curve through F to B to give the neckline.

From C draw a line almost straight to D and slightly rounded from D to E to form part of the front armhole.

Collar: For this pattern a piece of paper 7in. by 4in. is necessary.

Mark a point (R) on the base line and 1¾in. in from the left side line.

Mark a point (S) ¼in. up from the base line and 1in. in from the right side line.

Mark a point (K) ½in. up from the base line and 2in. in from the left side line.

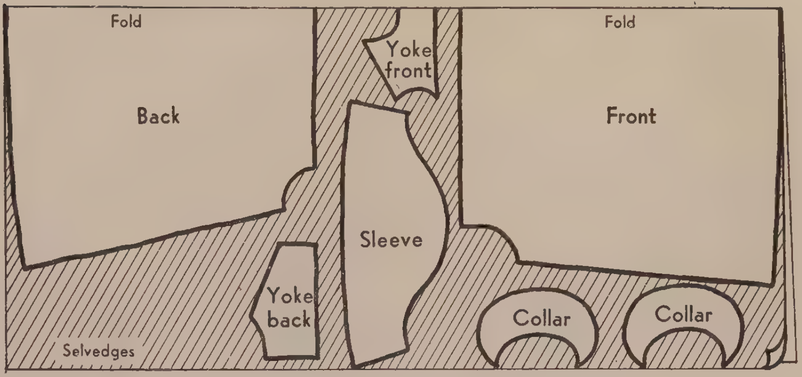
Mark a point (L) 1in. up from the base line and 2½in. in from the left side line.

Mark a point (M) 1¼in. up from the base line and 3in. in from the left side line.

Mark a point (N) 1⅜in. up from the base line and 4in. in from the left side line.

Mark a point (O) 1in. up from the base line and 5in. in from the left side line.

Draw a curved line from R to S connecting up all thé points R, K, L, M, N, O, and S to form the neck edge of the collar.



Laying out pattern pieces on 36in. wide material.

Mark a point (B) 1½in. up from the base line and ¼in. in from the left side line.

Mark a point (C) 2¼in. up from the base line and ¼in. in from the left side line.

Mark a point (H) 4in. up from the base line and 4in. in from the left side line.

Mark a point (T) 2in. up from the base line and on the right side line.

Draw a curved line joining the points R, B, C, H, T, S together to form the outside edge of the collar. R is the centre front of the collar.

Yoke back: For this a piece of paper 6in. by 5in. is required.

Mark a point (Z) 3¼in. up from the base line and on the left side line.

Mark a point (Y) 4¼in. up from the base line and 2⅜in. in from the left side line.

Mark a point (X) 2½in. up from the base line and ¼in. in from the right side line.

Mark a point (W) on the base line and ½in. in from the right side line.

Draw a curved line from Z to Y to form the neck edge.

Draw a straight line from Y to X and a slightly curved line from X to W.

Cutting out the Frock

To cut the frock out fold the material in halves lengthwise and place the pattern pieces as shown in the illustration at the bottom of page 581, the centre back, centre front, and centre front yoke on the fold of the material, and the sleeve, yoke back, and collar as indicated. The collar is in two pieces, a right and left half, and each is cut double, making four pieces.

When the frock is cut out there should be one front, one back, one front yoke, two back yokes, two sleeves, and four parts to the collar; one half collar is cut out and then the pattern is lifted and placed further along the material so that the other half can be cut.

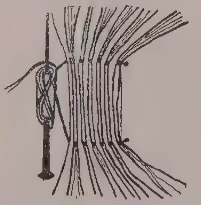
Marking off the Transfer

It is necessary to decide beforehand which smocking design is to be used, as this governs the number of rows of dots to be stamped on the material. The most convenient spacings are ¼in. between dots and ⅜in. between rows. The design used in the frock illustrated required 15 rows.

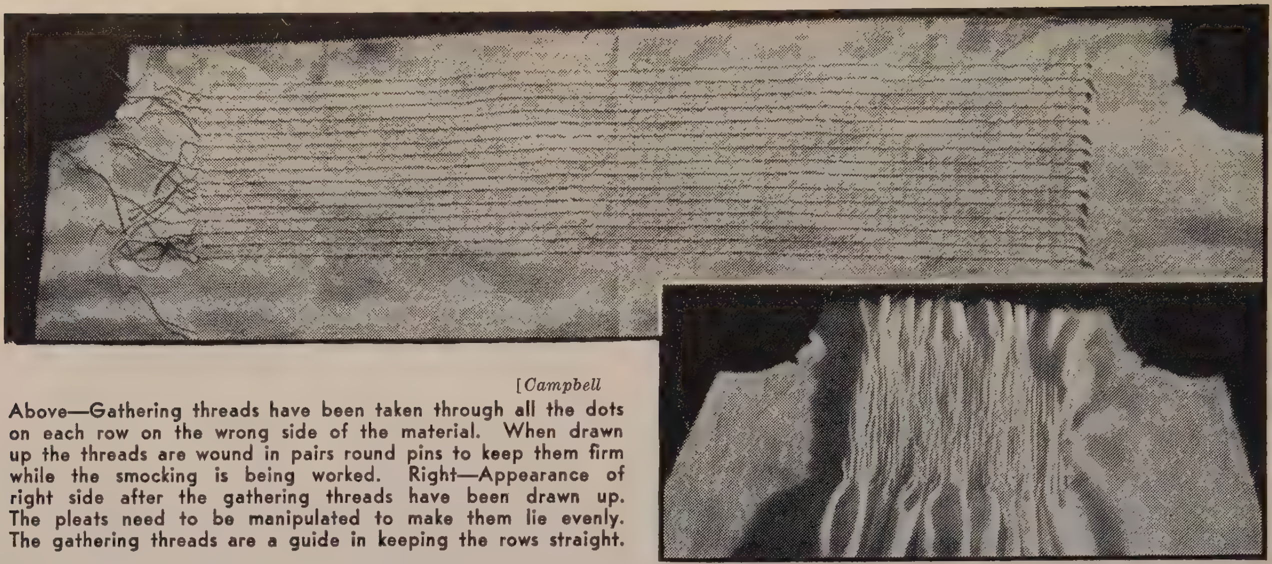
Open the front of the frock out flat and pin a smocking transfer in place 1½in. from the sleeve edge and ¾in. down from the top edge on the wrong side of the material. Using a warm iron, press the transfer on to the material; do not slide the iron backward and forward, as it may cause blurring of the dots.

Working the Smocking

With a needle and piece of cotton firmly knotted at one end run a thread through all the dots on one row; leave the end of cotton hanging loose. Repeat this with each row. When the running threads are all done draw them up evenly but not too tightly and secure the ends of cotton by winding them in pairs round a pin (see illustration at left). Pull the work so that the pleats lie evenly and turn the material to the right side where the smocking has to be done. The gathering threads will be a guide in keeping the lines of smocking straight.



When the smocking is completed the gathering threads are taken out, allowing the work to expand. If necessary, the work may be placed right side down on a thick ironing blanket and pressed lightly with a moderately hot iron over a dampened cloth. In this particular pattern only two basic stitches are used: Outline stitch (see illustration on page 584) is worked on rows 1 and 2 with a row of surface honeycomb between; this is repeated with rows 3 and 4, 12 and 13, and 14 and 15. The diamonds are worked in 6 rows of vandyke stitch (an elaboration of outline stitch), 3 rows upward between rows 8 and 5 and 3 rows downward between rows 8 and 11. A small dot catching two pleats together is made in the centre of each diamond. If a frilled sleeve is being made, a very narrow hem is taken along the bottom edge, care being taken to have a right and a left sleeve. Two rows of dots are stamped on to the material, the first row about ½in. to ¾in. above the hem. The smocking is worked exactly as on the first and second rows on the frock.



[*Campbell*

Above—Gathering threads have been taken through all the dots on each row on the wrong side of the material. When drawn up the threads are wound in pairs round pins to keep them firm while the smocking is being worked. Right—Appearance of right side after the gathering threads have been drawn up. The pleats need to be manipulated to make them lie evenly. The gathering threads are a guide in keeping the rows straight.

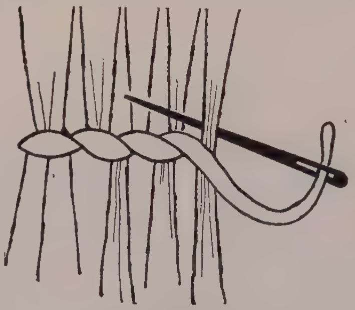
Making up the Frock

All pattern pieces have ⅜in. allowance for turnings. Make a ⅜in. hem at the centre back edge of the back yoke pieces, being careful to have a right and a left side. Join the back yoke pieces to the front yoke at the shoulder with a french seam or flat felled seam. Make a 3in. slash down the centre back to point S on the pattern. Make a narrow hem down each side; then lap the right side about ½in. over the left and stitch down securely. Gather the top edge of the back and stitch on to the back yoke, making a lapped seam. Stretch the front of the frock, if necessary, to fit the yoke front, tack in place, and stitch down (as for the back).

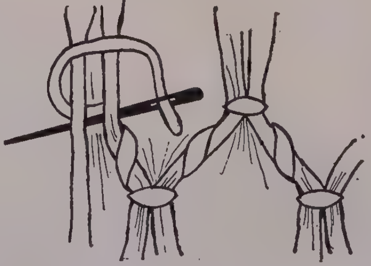
Join up the side seams of the frock, using french seams. Join up sleeve seams similarly. Run a gathering thread round the top of the sleeve ¼in. in from the edge; remember that a double row of gathering threads always makes the gathers easier to control while machining. Set the sleeves in place, putting the centre top of the sleeve to the shoulder seam of the frock, and the sleeve seam to correspond with the side seam of the frock. Stitch in place with a french seam or a plain overcast seam.

If the frock is being made of nylon, no seams must be left with raw edges, because this material frays readily.

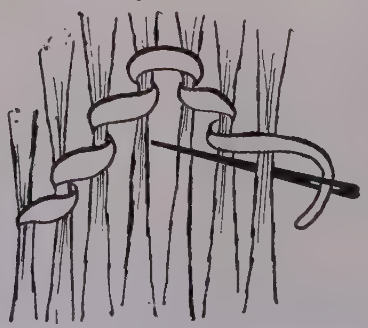
The collar is made next in two halves. Stitch round the outside edge of the collar ⅜in. in from the edge; turn the collar right side out and press well. It will be necessary to clip the seam allowance at intervals or even to cut some of it away to make the collar press neatly. Do the second half similarly. Set the collar on to the neckline, making the two halves meet at the centre front. Pin them in place. Cut a strip of material on the bias 1in. wide and about 1in. longer than the distance round the neckline of the frock. Baste the collar and bias facing, right sides together, round the neckline on the right side of the frock. Stitch down. Trim the seams, clip the seam allowance, and turn the bias facing to the inside; turn under the free edge and hem.



Outline stitch.



Honeycomb stitch.



Vandyke stitch.

Turn up a 1in. hem at the bottom of the frock. Make two buttonholes on the right side of the back yoke, one as near as it can be to the neck edge and the other just above the seam joining the skirt to the yoke. Sew on buttons to correspond and press the frock.

Smocking Stitches Used

The following are the smocking stitches used for the frock:—

Outline stitch: This is like stem stitch used in ordinary embroidery except that a pleat is taken up with each stitch. Bring the needle up on the left side of a pleat; then pick up the top of the next pleat to the right, allowing the needle to slant slightly upward to the left so that the resulting stitch will also slant. Draw the stitch up and continue to the end in the same way, taking up every pleat in turn.

Honeycomb stitch: This is one of the few smocking stitches worked from right to left. Beginning at the right-hand end, bring the needle up from the wrong side to the left of the second pleat; take a back stitch over the second and first pleat; then take the needle down on the right side of the second pleat, take the needle through this pleat and the next one (third), and take a back stitch over these two. Then take the needle up the right side of the third pleat, take the needle through this pleat and the next, and make a back stitch over these two. Continue in this way to the end.

Vandyke stitch: Stitches worked in vandykes are a feature of smocking and give scope for innumerable arrangements. Outline stitch is one of the easiest to use for this purpose. Instead of making the stitches in a straight row work each a little higher than the last up to the gathering thread above, in this case to the second above; then work each a little lower than the last down to the gathering thread on which the work began.

HEADING PHOTOGRAPH: *Garrya elliptica* produces its long silvery grey inflorescences in July and August. It is perhaps one of the most popular outdoor shrubs and it also makes an excellent subject for indoor decoration. Green and Hahn photo.

Pendulous Plants for the Flower Garden

FOR adding grace and beauty to the garden, greenhouse, or porch no better way can be found than in the use of pendulous plants. With their drooping flowers or stems they give an attractive and unusual display to suit all positions. In this article R. R. White, Horticultural Instructor, Department of Agriculture, Dunedin, discusses the ways in which these plants can be used. Flower garden work for January is dealt with by H. P. Thomas, formerly Horticultural Instructor, Department of Agriculture, Wanganui.

THERE is available a wide range of plants of drooping habit. In some cases the stems or boughs droop and in others the flowers form catkins which hang down gracefully. Making use of this habit, the gardener can easily add variety to his garden, and in a greenhouse or porch overhead bareness can be eliminated.

Outside, pendulous plants can be used in a number of ways to beautify the landscape. In lawns and large grassy areas trees which have a drooping habit are excellent for specimen planting. Of these perhaps the best known are the weeping elm and weeping ash. These fine trees give beauty all the year round: they have green foliage during spring and summer, highly coloured foliage in autumn, and silvery branches in winter. Also, many flowering prunus species are used widely as ornamental pendulous shrubs planted in lawns.

For country districts the weeping willow is very popular for background cover or for planting alongside small streams. The long trailing branches are usually first to show green in early spring, and in autumn with their leaves turning yellow they have added beauty.

The planting of these trees and shrubs does not vary in practice from that of any other type except perhaps for the need for some support in the early years of establishment. As with all planting the soil should be well worked up to a good tilth and the hole to accommodate the roots should be large enough to allow the whole rooting system to be spread out. Depth of planting can usually be gauged from the soil mark on the tree as it was planted in the nursery and the tree should be replanted to the same depth. After the hole is dug it is best to fill the centre portion of the bottom slightly to form a low mound so that the root system is on a firm base. After the plant is placed in position the soil is then replaced round the roots and firmly tramped to consolidate it.

Should the tree require support, a stake about 1½in. square should be driven in before the tree is planted. This is placed as near to the centre as possible. After the tree is planted the standard on which the tree is growing should be tied to the stake. Various types of material are used for tying. Strips of old cycle tyre are very good. The tie is made by placing the strip round the trunk and then crossing it over to form a figure 8 by tying it round the stake. Two or three such ties up the trunk will hold it steady and prevent damage by rubbing. A fertiliser such as superphosphate may be added during planting to stimulate root growth. Any broken root or branch tips should be trimmed with secateurs. If the soil is dry, a good soaking with water after planting should be beneficial.

Of the catkin bearing trees perhaps the best known is *Garrya elliptica*, though there are numerous others such as the birches, poplars, and willows.

Some roses are used as weeping standards and these can be planted either in a rose bed or in a lawn. Their treatment is the same as for standard roses.

Some shrubs with catkin-like flowers can be used for training over pergolas or along veranda edges. Of these, wistaria is outstanding and is easily trained.

Cantua bicolor var. *pendula* is another semi-shrub that can be easily trained over pergolas and the Japanese honeysuckle, *Leycesteria formosa*, which has catkin-like flowers, is best grown in the border.

Trees suitable for outside planting in lawns or open spaces as pendulous plants are:—

	Approx. height
Acer dasycarpum pendula ..	18 to 25ft.
Betula pendula	45 to 60ft.
Fagus sylvatica var. *pendula* ..	65 to 80ft.
Fraxinus excelsior var. *pendula*	65 to 80ft.
Prunus serrulata	15ft.
Prunus persica x var. *pendula*	15 to 20ft.
Prunus subhirtella var. *pendula*	15 to 20ft.
Pyrus salicifolia var. *pendula* ..	15 to 25ft.
Salix caprea pendula	10 to 20ft.
Salix vitellina var. *pendula* ..	40 to 50ft.
Sophora japonica var. *pendula*	15 to 25ft.
Ulmus glabra pendula	15 to 25ft.

[*Douglas Elliott*

Wistaria, with its drooping flowers, is one of the finest spring flowering climbing plants for training over pergolas and verandas.

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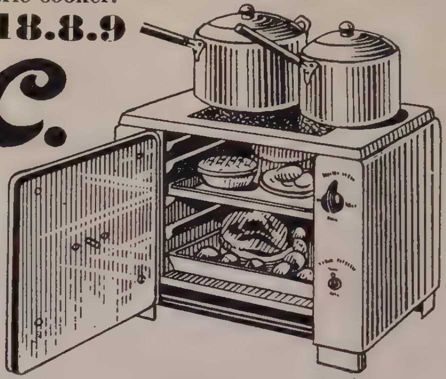

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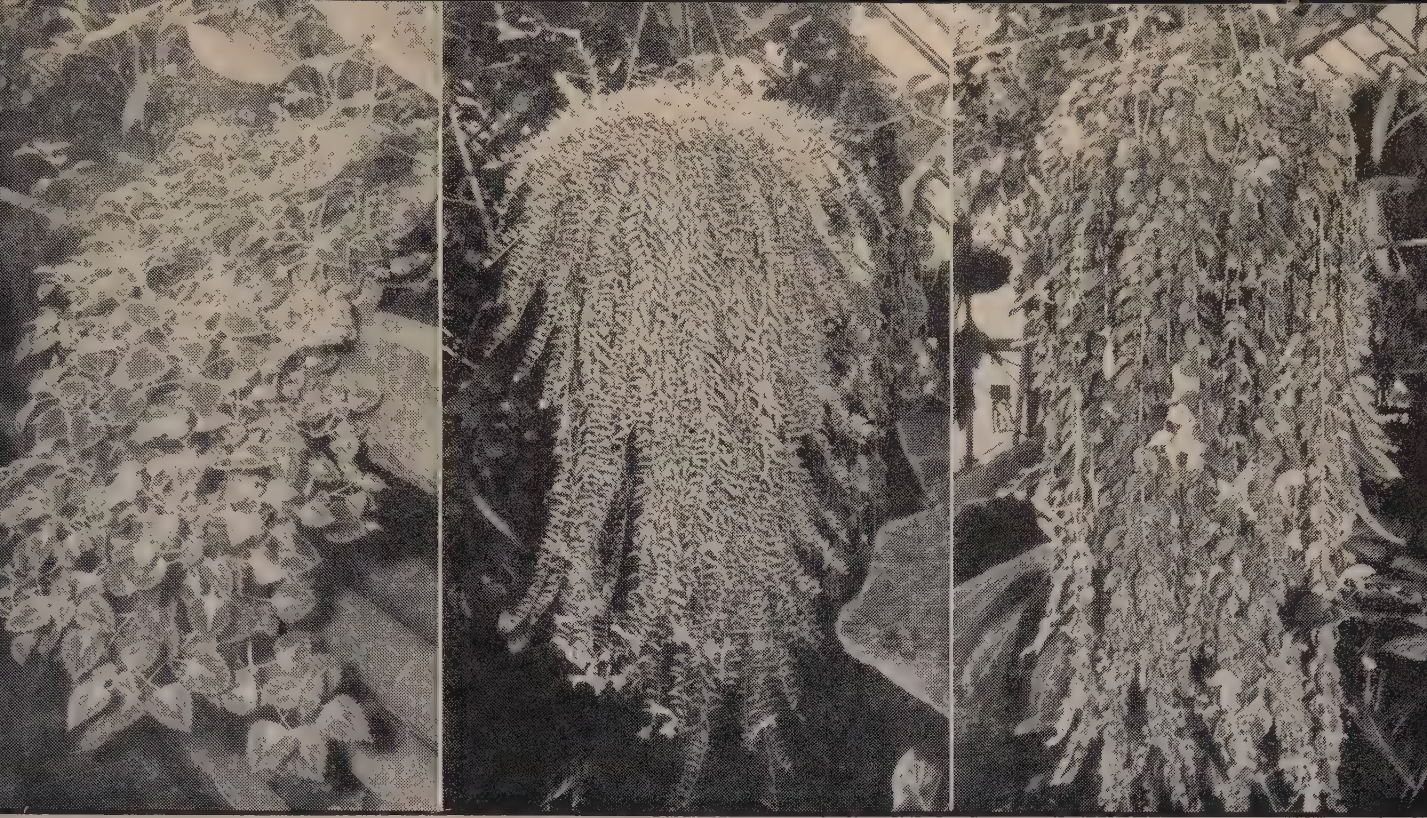

[*Campbell*

Left—*Coleus picta*, with its colourful foliage, can be used as an edge of bench display or used in baskets in the greenhouse. Middle—Aeschynanthus requires warm house conditions. It is very colourful with its bright green foliage and bright red flowers. Right—Columnea has brownish green leaves and orange red flowers. Easily propagated, it grows well in the warm greenhouse.

Catkin bearing trees for specimen planting:—

Alnus glutinosa	18 to 25ft.
Betula maximowiczi	60 to 90ft.
Betula nigra	50 to 90ft.
Betula pubescens	50 to 60ft.
Carpinus betulus	50 to 80ft.
Carpinus caroliniana	30 to 40ft.
Castanea sativa	80 to 100ft.
Garrya elliptica	6 to 12ft.
Populus tremula	50 to 60ft.
Populus tremula var. *pendula* ..	30 to 40ft.
Salix bocki	8 to 10ft.
Salix caprea	10 to 25ft.
Salix gracilistyla	6ft.

Weeping shrubs on standards:—

Cytisus scoparius pendula
Forsythia suspensa
Prunus serrulata
Prunus subhirtella
Roses
Ulmus glabra
Wistaria

Shrubs with catkin-like flowers:—

Leycesteria formosa
Wistaria (climber)

Pendulous plants can also be used for providing cover on banks and walls. These can be very useful, especially where a bank is steep and perhaps unsightly. The plants are set out at the top and allowed to grow downward. Many of these types are perennials, some are of a succulent nature commonly known as ice plants, and others are small shrubs. The soil should be enriched to maintain good growth. Some plants such as aubrietia can be cut back each year to encourage new growth the next season.

Plants to provide cover for low walls, tree stumps, and rockeries are:—

Alyssum saxatile
Arabis vars.
Aubrietia vars.
Armeria laucheana
Campanula carpatica
Campanula portenschlagiana
Ceratium var.
Dianthus
Helianthemum var.
Hutchinsia spp.
Phlox subulata
Saxifraga spp.
Sedum spp.
Tropaeolum

Plants to cover banks are:—

Cotoneaster horizontalis
Rosmarinus
Mesembryanthemum spp.

For inside use in greenhouses and porches pendulous plants are best grown in baskets or bowls. These plants can be raised from seed or from cuttings. When large enough they can be either potted up or planted in a hanging basket. Wire baskets are probably best and these can be lined with wet moss, sphagnum being the best, and then filled with soil. A good soil mixture is one consisting of 7 parts of loam, 3 parts of leaf-mould or peat, and 2 parts of sand. To this mixture is added 1½oz. of superphosphate, 1½oz. of dried blood, ¾oz. of sulphate of potash, and ¾oz. of carbonate of lime to every bushel of mixture. Plants should be placed around the basket edge about 4in. apart and given a good watering. The baskets can then be hung up. It is necessary to have a good form of suspension, as the baskets become very heavy when watered. Frequent watering is necessary, as the baskets with greater air circulation around them dry out fairly quickly.

Plants suitable for hanging baskets are:—

Aeschynanthus
Begonia
Coleus picta
Columnea
Fuchsia
Geranium (ivy leaf)
Lobelia
Tropaeolum
Zygocactus

Garden Work for January

A few weeks of hot, sunny weather will make the flower garden look weary and untidy if care is not taken to attend to such details as the removal of dead flower heads and spent annuals. Other work to be done as it becomes necessary is staking, watering, mulching, weeding, and spraying.

Bedding out

There should be no delay in planting out some of the following plants for a late display:—

French and African marigolds, petunias, *Phlox drummondi*, salvias, portulaca, calendulas, verbena, antirrhinum, kochia, and celosia.

Many of these varieties stand dry weather and will flower through until the winter. If the soil is dry, it will be necessary to water the plants before and after setting out, preferably during late afternoon, to give them a reasonable start.

Bulbs

Most spring flowering bulbs may now be lifted, dead leaves removed, and the bulbs left to dry thoroughly, but care must be taken to see that they are not left too long in direct sun.

After they have been dried out and cleaned they should be placed in single layers on shelves or thinly in wooden trays in a dry, airy, cool place.

The bulb planting season will soon be round again; therefore it is now time for gardeners to consider requirements and place orders for new bulbs before the best ones have been sold. The bulbs on receipt should be unwrapped and stored as advised, until they are needed for planting at the end of February or during March.

Cuttings

Cuttings of many shrubs and garden plants may be taken at this time of the year from semi-matured wood of the current season's growth. These are known as half-ripe cuttings and they may be inserted in a cold frame. Small improvised frames may be made by the home gardener by using boxes with or without bottoms and covering

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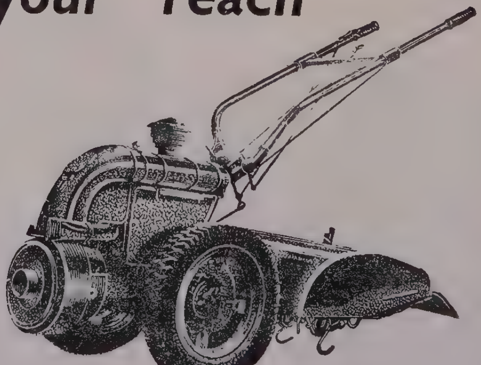

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The rose is the undisputed queen of the summer garden. For the finest flowers roses should be disbudded, the side buds being removed and the centre one on each stalk being left to develop.

these with a sheet of glass for several weeks at least. The main object of the frame covering is to provide shade and maintain a moist atmosphere which prevents the leafy cuttings from flagging and the soil from drying out. The rooting medium may be composed of clean sharp sand, or perhaps a better medium for the home gardener to use would be equal parts of sand, loam, and leaf-mould thoroughly mixed. Good drainage should be provided. If pure sand is used, the cuttings would need to be removed into pots or boxes of a mixed compost as soon as roots were formed. Among the plants from which cuttings may be taken are aubrietia, pentstemons, hybrid wallflowers, dianthus (pinks), carnations, fuchsias, and catmint, and also shrubs such as *Lonicera nitida*, *Azalea indica*, buddleias, salvias, cytisus, mock orange, hydrangeas, lavender, and many ornamental conifers.

Rock Gardens

Care of rock gardens at this time of the year includes removing spent flowers not required for seed and ensuring that vigorously growing plants do not smother less vigorous ones. A rockery should be kept free from weeds as its full beauty cannot be appreciated if it is not kept tidy.

Layering Carnations

After flowering, border carnations may be increased by layering in January. The soil round the plants should be made free of weeds and well broken up with a hand fork. The addition of further soil comprised of fibrous loam, leaf-mould, and sand round the plants to be layered would possibly improve the layering bed and assist rooting. A number of the lower shoots which have not flowered should be selected, and some lower leaves removed from these. The cut should be started about ½in. below a joint and carried on up the centre of the stem through the joint until about ½in. above it. The shoot should be bent down into position, the tongue being kept open and the stem just below the surface of the soil. It should be fixed securely in this position with a wire peg or forked stick. A little more soil should be placed over it and if the layer is kept moist and left undisturbed until early April, it should have formed roots. To obtain the finest individual blooms carnations should be layered every year, but to have them in greater abundance the plants may be left undisturbed for 2 or 3 years.

Viola, Pansy, Aubrietia

By January viola and pansy may have become overgrown and exhausted by continuous flowering and when this happens the top growth should be cut to within an inch or two of the ground to encourage it to send up new shoots which would provide suitable cuttings for raising new stock, or for a second flowering in the autumn. Aubrietia plants may also be propagated by layers or by division after flowering.

Seed Sowing

Seeds of the following plants may now be sown:—

Cinerarias, *Primula malacoides*, calceolarias, schizanthus, violas, Brompton and Beauty of Nice stocks, Iceland poppy, *Meconopsis betonicifolia* (Himalayan blue poppy), anemone, and ranunculus.

Biennial plants such as wallflower, sweet william, and myosotis if not sown earlier may still be raised from seed during January, but no time should be lost.

Budding and Summer Pruning of Roses

Budding of roses may be carried out when the bark lifts freely from the wood, normally during late January and February. Roses will be at their best at this time of year and doses of liquid manure, a little at a time and applied often, will promote a longer period of flowering. This stimulant should be applied when the soil is wet. Rose blooms should always be cut with stems as long as possible to prevent the bushes from becoming ungainly and to encourage flowering from strong new shoots below. For the same reason faded roses should be removed by cutting the stem back to the next flower bud or strong shoot instead of removing the flower only.

Lawns

New lawns are best sown in March on soil which has become consolidated; therefore attention to the area set aside for the new lawn must be given now if sowing is contemplated.

Levelling and firming are very necessary, but at the same time light hoeings must be frequently carried out to destroy weed growth while it is still young.

Where grass-grub is causing damage to established lawns the following measures may be taken:—

To 1½lb. of 50 per cent. wettable D.D.T. mix 61lb. of dry sand or soil or 61lb. of the standard lawn topdressing (3 parts of sulphate of ammonia to 1 part of superphosphate) and apply the mixture at 1oz. per square yard (sufficient for 1000 sq. yds. of lawn). Alternatively the 1½lb. of 50 per cent. wettable D.D.T. could be applied in water, using 100 gallons for each 1000 sq. yds. of lawn.

At this time of the year lawns which can be watered should be given a good soaking before they begin to go brown. An occasional thorough soaking does more good than frequent light sprinklings, which only moisten the surface without wetting the lower levels where the roots need it most. This applies equally well or perhaps more so to flower borders.

Gladiolus

Gladiolus are now in full bloom and care should be taken with the staking, as the latest varieties are so large and heavy that they are easily damaged by wind. Plants may be fed when the flower bud can be felt inside the sheath of leaves. A light topdressing of superphosphate and sulphate of ammonia at ⅓oz. per square yard well watered in or an application of liquid animal manure diluted with water to the colour of weak tea may be used. One or two applications should be sufficient to ensure a good garden display. Faded flowers should be removed as they become past their best to keep the others in tidy surroundings. When the flower spikes are being cut as many leaves should be left on as possible to help feed the developing corms.

Work under Glass

Under glass plenty of ventilation is essential both day and night, and during very warm weather floors may need damping down. Pot on where required cyclamen, cinerarias, begonias, calceolarias, primulas, balsams, and perpetual flowering carnations for a display during the coming winter.

Many of these plants will benefit by light applications of weak liquid manure at this period of their growth.

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